Reassessing the prehistoric ceramics of the Late Neolithic and Transitional Chalcolithic periods in the Central Plateau of Iran: Archaeometric Characterisation, Typological Classification and Stylistic Phylogenetic analyses

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Reassessing the prehistoric ceramics of the Late Neolithic and Transitional Chalcolithic periods in the Central Plateau of Iran:

Archaeometric Characterisation, Typological Classification and Stylistic Phylogenetic analyses

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Abstract

This thesis introduce new approaches into the understanding of chronology and cultural-technological development of the Neolithic and Chalcolithic settlements within the Central Plateau of Iran through the study of the evolution of ceramic craft specialisation between ca. 5700-4800 BC by analysing newly excavated pottery from the different three areas of this region: the Tehran, Qazvin and Kashan plains. Despite having been investigated for almost 90 years, the prehistoric ceramics of the Central Iranian Plateau have mainly been studied in a basic manner, based on the study of colour and decoration of pottery as the criteria to identify, characterise, and compare the various pottery types of the region with little attention to technology and production.

In the present thesis a multidisciplinary research method has been adopted by utilising scientific analysis technics such as X-ray Diffraction (XRD), X-ray fluorescence (XRF) and scanning electron microscope (SEM) as well as typological classification and more advanced methods such as phylogenetic analyses in studying and characterisation the pottery.

Based on the results of scientific analyses as well as the archaeological data this research will provide valuable information on the course of evolution and the origin of the changes observed in ceramic technology, and will determine the level of specialisation and standardisation in the pottery-making, as well as the mode of production in these prehistoric sites. Through comparison of the pottery characteristics from different sites of the same tradition it will also assess the similarity of sources of raw materials and the techniques of shaping and firing the pottery. Utilising the valuable information gathered by the aforementioned methods this thesis represents a more comprehensive and reliable information concerning the economic and cultural connections and interactions of the prehistoric communities living in this region in the Late Neolithic and the Transitional Chalcolithic periods.

Statement of Copyright

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Chapter 1: Introduction

1.1 Introduction

Iran is located in the Middle East and borders the Caspian Sea, Persian Gulf and Arabian Sea. Its geography is characterised by high mountain ranges that enclose several broad basins or plateaus, on which major agricultural and urban settlements are located. The centre of Iran consists of several closed basins that collectively are referred to as the Central Plateau of Iran and defined by the Zagros Mountains from the northwest to the southeast, the Alburz Mountains in the north and the Kopet Dagh in the northeast. The eastern part of the Central Plateau is covered by two salt deserts, the Dasht-i-Kavir (Great Salt Desert) and the Dasht-i-Lut and, apart for some scattered oases, they are uninhabited. In the last four decades, a number of scholars, such as Majidzadeh (1976), Voigt and Dyson (1992) and Malek Shahmirzadi (1995), have made the term Central Plateau a popular description for this region as both a cultural zone and geographical area. The main geographic features of the region include mountains, deserts and plains.

The average elevation of the Central Plateau is about 900 metres and it has played a prominent role in Iranian cultural, technological and political development as well as functioning as an important trade route connecting Mesopotamia, northern Iran and central Asia, with a number of settlements dating from the Neolithic to the historic period. Hence, the Central Plateau is one of the most important regions in Iran for studying the prehistory of the region and that of its neighbours more widely. The societies of this region have been at the centre of at least three millennia of sustained and continuous change from the sixth millennia BC onwards, playing an active role in cultural and technical-economic development through their intraregional and interregional interactions. The deep cultural deposits of archaeological remains, reaching to over 10 metres at some sites, along with the sustained progress and advancement in technology and innovation, make this region very attractive for prehistoric studies.

Since the 1930s, when systematic archaeological research in the Central Plateau was began by both foreigners and Iranians, archaeologists have been engaged in the study of the historical, cultural, technological and socio-political development of the Central Plateau (Young 1987; Abdi 2001). Despite having been studied for almost 90 years, the prehistoric ceramics of the Central Iranian Plateau have only been studied in a basic manner, restricted to the descriptive classification meth3odologies. Indeed, colour and decoration have been the main criteria used for identification, characterisation, and comparison between the various pottery types of the region with little attention to technology and production. In this way, ceramics of similar colour and decoration have usually been classified and attributed to a single common group, sometimes called traditions, such as Sialk I or Sialk II (Ghirshman 1938, Malek Shahmirzadi 2006). Hence, the exact origin of similarities between different in terms of export of products, cultural interaction or technology transfer has not been the focus of study but instead, hypothetical movements of people as one tradition replaced another (Majidzadeh 1981).

This thesis aims to provide a new insight into the study of the pottery in this region by analysing a newly excavated cohort of pottery from the different three areas within the Central Plateau of Iran: the Tehran, Qazvin and Kashan plains. As they were recovered from more recent excavations at the sites of Tepe Pardis in the Tehran plain (2003, 2005 & 2006), Ebrahimabad in the Qazvin plain (2006) and Sialk in the Kashan plain (2008 & 2009), they all come with stricter control on stratigraphy and the use of radiocarbon analyses for absolute dating (Figure 1.1). As a result, they offer an ideal collection to study to the chronology and cultural development of the ceramic traditions of the Central Plateau of Iran in the Late Neolithic and Transitional Chalcolithic periods (Table 1.1).

Figure 1.1 Map of the Central Plateau of Iran showing the location of sites discussed in this research.

1.2 Aim and objective of the research

This thesis aims to introduce new insights and approaches into the study of the socio-economic transformation of the Late Neolithic and the Transitional Chalcolithic settlements within the Central Plateau of Iran. This aim will be achieved through the study of pottery development and associated changes in ceramic production craft specialisation from the Late Neolithic through to the Transitional Chalcolithic (ca. 5700-4800 BC) period of the Central Plateau in Iran. It is proposed that providing additional information in this connection will also help better understand the chronology and cultural-technological development of this region as well as the economic and cultural connections and interactions between prehistoric communities living in the Central Plateau at that period.

This aim is supported by the following objectives:

1. To geographically contextualise the Central Plateau of Iran and provide additional information concerning its palaeoenvironmental background.

2. To review the prehistoric periods, phases and ceramic traditions attributed by archaeologists working in this region in order to understand current chronological banding.

3. To undertake a typological classification of the ceramics collected from the three sample sites within the Central Plateau of Iran.

4. To undertake cladistic methods of phylogenetic reconstruction of the data sets comprising the decoration and pottery form from the three samples sites within the Central Plateau of Iran.

5. To undertake analysis techniques (XRF, XRD, SEM/EDX) to scientifically characterise the pottery sherds from the three samples site within the Central Plateau of Iran.

1.3 Overview of research

The thesis is divided into eight chapters, structured as follows. Chapter One provides the introduction, aims and objectives of this thesis and is followed by Chapter Two which, in fulfilment of the Objective One, investigates the geographical and palaeoenvironmental background of the Central Plateau of Iran. It is well known that changes in environment can elicit cultural responses such as settlement relocation and modification in subsistence strategies and thus climate, soil, flora, fauna, natural resources and topography of any given region must be taken into consideration in the dating and interpretation of material recovered from prehistoric sites. The information concerning the region’s soil and sedimentary sequences also assists the understanding of the geomorphology of the plain as a whole. Erosion and deposition are two geomorphological processes that affected the preservation of sites as well as the lives of their inhabitants but information concerning water resources and climatic change in terms of variation in temperature, precipitation and other climatic variables can also affect the physical pattern of the land as well as the nature and distribution of faunal and botanical communities. As a result, the archaeozoology and archaeobotany of the Central Plateau are very important in understanding the agricultural activities and the socio-economic life of the settlements located in the region during that time period.

Chapter Three presents the history of archaeological research in Iran and provides a detailed study of the key Late Neolithic and Transitional Chalcolithic sites in the region, which include: Tepe Sialk (Ghirshman 1938; Malek Shahmirzadi 2002, 2003, 2004, 2005, 2006), Tepe Cheshmeh Ali (Schmidt 1935; Fazeli 2001, Fazei et al. 2004), Tepe Zaghe (Malek Malek Shahmirzadi 1979, 1980; Majidzadeh 1978; Negahban 1979; Fazeli et al. 2005), Tepe Pardis (Coningham et al. 2004, 2006; Fazeli et al. 2004, 2007a), Tepe Ozbaki (Majidzadeh 2001, 2010a,b), Tepe Chahar Boneh (Fazeli et al. 2007b, 2009), Tepe Ebrahimabad (Fazeli et al. 2007c, 2009), Tepe Mafin Abad (Fazeli et al. 2002, 2004) and Tepe Sadeghabadi (Fazeli et al. 2002, 2004). Chapter Four defines the methodology for the selection, presentation and characterisation of the samples obtained from the excavations at the aforementioned sites of the Central Plateau, thus assisting the fulfilment of the Third, Fourth and Fifth Objectives of the thesis.

Chapter Five is devoted to the data analysis of the form and decoration of the selected pottery and the data is split into two sections. Firstly, the results of the typological classification, and secondly, the results of the phylogenetic analysis. This chapter assists fulfilment of the Third and Fourth Objectives of the thesis. The Pottery of the Central Iranian Plateau exhibits a variety of types and shapes, therefore, in order to better understand the ceramic evaluations, the similarity and difference between various forms of pottery is described utilising a typological classification. This chapter also presents the analysis of data obtained by applying cladistic methods of phylogenetic reconstruction to sets comprising the decoration of ceramics from the Central Plateau of Iran. In the past two and three decades, the use of the phylogenetic methods, which first developed in biology, have attracted the attention of numerous anthropologists as a method to investigate cultural diversity. This has been primarily because of the heightened awareness among social and behavioural scientists regarding the existence of some similarities between the evolutionary biology and human culture.

Chapter Six is devoted to the scientific analysis of the pottery thus assisting the fulfilment of the Fifth objective of the thesis. Determination of the chemical and mineralogical compositions and the sample microstructures will help us to better understanding the technical aspects of the pottery making and its development in the sites of the region. This will also provide the material basis for investigating the nature of changes in the ceramic production techniques which occurred during the Late Neolithic to Transitional Chalcolithic transition period (ca. 5200-4600 BC) in the region and verify the possibility of relationships between these technical changes with certain socio-economic changes occurring during this period in the Central Plateau of Iran. This also will provide a more precise means for comparison between the different pottery of the Central Iranian Plateau with each other and serve as a sound basis to clarify the nature of possible interactions between different prehistoric communities of the region.

Chapter Seven provides the results of the data collected from the prehistoric ceramics, namely the results of typological classification, phylogenetic analysis and scientific analysis, which are brought together and discussed. Hence, this chapter also assists the fulfilment of the Second, Third and Fourth Objectives of the thesis and Chapter Eight contains the conclusions of the thesis and suggestions for the further research.

1.4 Significance of the study

As stated above, the most common means of classifying the prehistoric pottery of the Central Plateau of Iran has been on the basis of colour and decoration, with little attention paid to the typological classification of the pottery and less on the application of scientific analysis techniques such as XRF, XRD, SEM/EDX, as well as more advanced techniques e.g. phylogenetic analysis.

For example Ghirshman (1938), who conducted systematic archaeological investigations on the Central Iranian Plateau and excavated the Sialk site for the first time, used similarities between pottery designs to define four main phases at the site. Of particular relevance to this study, he divided the North Mound, which contained the earlier cultural deposits of the Late Neolithic period, into two main phases, Sialk I and Sialk II. Sialk I, Late Neolithic period, mostly contained pottery possessing a coarse buff body with black painted decoration whilst Sialk II, Transitional Chalcolithic period, comprised red pottery, painted in black. Ghirshman's chronological differentiation, and the periodisation of pottery on the basis of their colour and decoration at Sialk, has had a strong and long-lasting influence on the work of subsequent researchers and even today continues to be a key cultural and chronological marker for the interpretation of the late prehistoric chronology of the Central Plateau of Iran. Negahban also divided the prehistoric chronology of Iran on the basis of the "pottery", as defined by appearance, into eight stages (Negahban 1996, 350) as did Majidzadeh (1981). The latter based his study on a cultural-historical approach and proposed a model to explain the changes in society within the Central Plateau. Majidzadeh used this model to try to explain the cause of the occurrence of distinct changes in societal development and the abandonment of settlement in certain prehistoric sites of the Central Plateau. For example, he attributed changes in two distinct phases at the site of Ghabristan to the arrival of new people who produced two "types of pottery" as defined by the colour of the excavated wares. These, he named the "Plum-Ware people" and the "Grey-Ware people" (Majidzadeh 1981:144,146).

Malek Shahmirzadi (1995), on the basis of characteristics of the excavated pottery and the production of certain pottery in some sites of the Central Plateau, also suggested four stages for the cultural sequence of the Central Plateau linked to the migration of people into the region who imported different types of ceramic manufacture to these areas.

These propositions were all simply based on the finding of some pottery with apparently novel and different colour/decoration in comparison with the existing ones. Indeed, the aforementioned traditional methods of the study of Iranian Central Plateau's pottery might lead to some confusion and misunderstanding, regarding the exact nature of socio-economic exchanges between various prehistoric societies by relying on external stimuli to the neglect of internal dynamics. More recent excavations, utilising scientific pottery analysis methods such as chemical analysis (ICP-AE) and petrography alongside C14 dating, have tried to gather further accurate and reliable information concerning the chronology and cultural development of the Central Plateau of Iran in the Late Neolithic and Chalcolithic periods.

For example, Fazeli, et al. (2001) studied surface collections of ceramic sherds from six Late Neolithic to Middle Chalcolithic sites located in the Tehran Plain, utilising chemical analysis by (ICP-AE). He observed some differences between the chemical composition of sherds belonging to different sites, perhaps indicating the use of similar but discrete clay resources in each site that were possibly local to the site.

Wong et al. (2010) later studied Cheshmeh Ali pottery collected from several sites in the Qazvin and Tehran plains utilising geochemical and petrographic analyses. They suggested the existence of local rather than centralised production for these pottery wares in this region at the specified period. These findings are very significant for understanding the details of production and distribution of these pottery wares in this region in the Transitional Chalcolithic period.

Fazeli et al. (2010) also studied a collection of pottery sherds excavated in the site of Pardis (Tehran plain) which were concentrated on the paleo-technological aspects of the pottery making at Pardis. The authors suggested that the change from the buff pottery of the Late Neolithic to the red pottery wares of the Transitional Chalcolithic did not involve different raw materials or higher firing temperatures but identified that they probably had been fired for longer times in the more efficiently controlled firing conditions. They also reported the possible use of an early potters' wheel at Tepe Pardis, demonstrating that the potters of Pardis had a basic familiarity with this specialised forming technique.

Considering the above points, it was decided to undertake a more comprehensive and thorough study to better clarify the nature of the socio-economic transformations of the Neolithic and the Chalcolithic settlements located in the Central Plateau of Iran through the study of evolution of craft specialisation in the production of pottery from the Late Neolithic through the Transitional Chalcolithic periods in the Central Plateau utilising a multidisciplinary research program consisted of more advanced and novel methods of the pottery study.

The methods utilised in the present study include typological classification and more advanced methods such as phylogenetic analyses in which the cladistic methods of phylogenetic reconstruction are applied to data sets comprising the decoration and form of ceramics. This method has been used for the first time in the pottery analysis of Iran and is augmented by the use of scientific analyses in which ceramics were characterised utilising X-ray Diffraction (XRD), X-ray fluorescence (XRF) and scanning electron microscope (SEM).

X-ray fluorescence (XRF) studies

There are many different techniques for the chemical analysis of archaeological artefacts; in this research, we used X-ray fluorescence (XRF) technique that reveals the similarity of the chemical compositions of the selected samples of a given site indicating the existence of a common resource of clay raw materials used in the production of the pottery during a specific time period. On the other hand, the chemical compositions of the selected specimens, besides the results of other analysing techniques, such as XRD and SEM/EDX can help identifying the type of raw materials used in the making of the pottery.

Moreover, the homogeneity of the chemical compositions of pottery samples also can be a clue to show the existence of a degree of specialisation in the production of pottery in the site. The chemical compositions of pottery may also provide a more precise means for comparison of the different pottery of Central Iranian Plateau with each other and serve as a more reliable basis to clarify the nature of possible interactions between different prehistoric communities of the region.

X-Ray Diffraction (XRD) Studies

X-ray analysis has attracted much attention in archaeological science because it can provide useful information about the technology of making and firing ancient pottery. X-ray Diffraction (XRD) is one of the most popular techniques for identifying minerals present in ceramics. Detecting and determining the nature of the minerals present in ceramics by XRD can provide an indication of the firing history of the bodies. The estimation of firing temperature through XRD is based on the fact that the mineralogical composition of clays changes during firing. These changes include the loss of water from the clay and other minerals, the decomposition of the carbonates and the formation of various new crystalline minerals. These changes can be monitored by XRD.

The examination of XRD traces sometimes also can be used to determine the raw materials used in the production of the pottery. On the basis of the experimental results of XRD concerning the mineralogical compositions of pottery produced at different time periods, it is possible to study the course of development in pottery making and the degree of specialisation at a given site across time periods. The mineralogical data besides the microstructural information obtained by SEM/ EDX can also reveal the existence of the gradual development of the pottery industry in connection with resources and firing technology that could be connected with the progress in the skill, knowledge and information of the local potters or the occurrence of more abrupt socio-economic changes, or outside interference that led to the changes in societies and settlements abandonment in some areas of the Central Plateau.

The mineralogical compositions of pottery, besides the chemical compositions also can be used to make comparisons between the pottery from different sites of the same type (considering the colour and painting of pottery) in order to assess the similarity of sources of raw materials and the techniques of firing the pottery. This can provide very valuable information about the economic and cultural connections and interactions of the prehistoric communities living in this region in the proposed time periods.

Microstructural Examinations

Scanning electron microscopy (SEM) analyses the surface of materials and provides detailed high-resolution images of the sample by rastering a focussed electron beam across the surface and detecting secondary or backscattered electron signal. An Energy Dispersive X-Ray Analyser (EDX or EDA) is also used to provide elemental identification and quantitative compositional information (Pollard et al. 2007: 109). There is also the possibility of creating X-ray mapping for the specimens in the above technique.

In this way, the whole surface area analysed is systematically mapped in terms of mineralogy or elemental composition and the resultant data provides a false colour mineralogical/compositional map of the sample. Sometimes, the nature and extent of the changes occurred during the firing process in ceramics, such as the estimation of the degree of vitrification within the clay matrix of ceramics can also be observed and determined by SEM.

SEM micrographs of pottery samples can also depict the degree of uniformity of microstructures, the particle sizes and shapes of different phases and the quantity, shape and size of pores present in the pottery structure. They also can show the existence or absence of organic or inorganic tempers in the starting clays of pottery specimens.

The SEM/EDX and the elemental spectra /maps can also reveal the causes of the general chromatic change of the pottery from the Late Neolithic to the Transitional Chalcolithic periods. For example, the two different types of Sialk I (Late Neolithic period) and Sialk II (Transitional Chalcolithic) pottery possess coarse buff body with black painted decoration and fine red pottery, painted in black, respectively. SEM elemental spectra exhibits a relative difference in iron content, which is responsible for the red colour of Sialk II specimens, between the surface and core of the red pottery can show the existence or the absence of a red coating on their exterior (also possibly on the interior) surfaces.

If the elemental spectrum of Sialk II samples exhibit a relatively large difference in iron content between its surface and core, it has a red coating on its exterior (sometimes also in interior) because the red coating contained a considerable amount of hematite (Fe_2O_3) but in the core there is insufficient iron oxide. While, the specimens which are red both on the surface and core exhibit a much smaller difference in iron content. Sialk II type red pottery without a red coating on their surfaces may owe their red colour to a change in the raw materials (clays) and/or the more efficient control of firing atmosphere and temperature.

It is interesting to note that the difference observed between the content of iron on the exterior surface and core of the specimens, as determined by SEM elemental map of different sections was proven to be extendable to other pottery sherds as well, and therefore can be introduced as a good criterion to show the existence or absence of a red coating or slip on the surface of the pottery.

Typological classification of pottery

Typology can simply be defined as the result of the classification of artefacts according to their characteristics, such as form, composition and decoration. As described above, the most common means of classifying pottery in the Central Plateau of Iran has been on the basis of colour and decoration, with very little attention paid to form. As a result, part of this research will be focused on form. This is the first time that, to the best of our knowledge, such an approach has been attempted within the Central Plateau. The pottery of Central Plateau has a variety of types and shapes, hence, in order to better understand the ceramic evaluations, the similarity and difference between various forms of pottery will be described.There are two different approaches to the typological classification: ‘splitting’ and ‘lumping’. The latter approach tends to give very broad definitions, which can encompass large variations in form, hence the approach of the 'lumping' together of ceramics with similar attributes, such as body, rim and base shape has been adopted in this study.

The ceramics from individual sites were split into a variety of wares, according to their rim or base shape. In this way, ceramics have been divided into a number of broad categories: Jars (form J), Bowls (Form B), Beakers (Form BE), Trays (Form T), Bases (Forms F and R) and Dishes (Form D). Each of these categories has been further subdivided, generally along the lines of having open or closed mouths as well as steep or shallow sides. Following the conventions outlined by Coningham and Ali (2007), the form of various wares are defined according to their height and diameter ratios. There is distinct variability within ceramic forms that were usual in most past communities. The reasons behind this variation are diverse and include both technological and social factors (Miller 1985). Variation can merely result from the different potters and production facilities involved in manufacturing similar vessels, utilising different skill-sets, resources and techniques (Sinopoli 1988).

Determination of the existence of various form types of pottery at each individual site in different time periods and the analysis of data on the details of various form types and their location can show the more abundant common pottery forms at each site and in the specific time period. It can as well provide a means to determine the possibility of the existence of exchange and long distance trade of pottery wares across the whole area of the Central Plateau covered by this study.

Phylogenetic analyses of the decoration and form of the pottery

The cladistic methods of phylogenetic reconstruction will also applied to assembled databases of pottery design and form from the Late Neolithic through the Transitional Chalcolithic periods belonging to six different sites from Central Plateau of Iran. Phylogenetic analyses can illustrate the existence of cultural interactions and possible exchange and long distance trade of pottery wares across the area of the Central Plateau covered by this study.

In summary, typological classification, phylogenetic analyses and the scientific analyses of pottery specimens, as described above, will fulfil the aim of the present thesis as well as answer the following fundamental questions:

- What caused the general chromatic change of pottery from the Late Neolithic to the Transitional Chalcolithic periods?
- Did this change involve a replacement of selected base materials or rather was it a consequence of refinement of the firing technology?
- What evidence is there for continuity and change in ceramic technology as well as long distance trade, between the Late Neolithic and Transitional Chalcolithic at Central Plateau of Iran?

1.5 Conclusion

This introductory chapter has presented the aims, objectives and significance of this thesis. It has also identified the types of data used in this study. As this research utilises both scientific and archaeological data, it represents an original study of the archaeology of the Central Plateau of Iran during the Late Neolithic and Transitional Chalcolithic periods. As stated above, this thesis will utilise newly excavated unpublished pottery from the three different areas within the Central Plateau of Iran – all of which the candidate was personally involved in the excavations. The comparison of the pottery from different sites of the same tradition can be quite revealing, especially in assessing the similarity of sources of raw materials and the techniques of shaping and firing the pottery. This may provide valuable information about the economic and cultural connections and interactions of the prehistoric communities living in this region between the Late Neolithic and the Transitional Chalcolithic periods and advance the nature of the academic environment from a discussion of potential external influences to a discussion of processes and dynamics.

Table 1.1 The sequences and dating of the selected pottery of the three sites of Central Plateau.

Site	Period	Trench	Levels	Calibrated date with 95% probability (BC)
Sialk	**Sialk I Late Neolithic (Early)**	**VI**	**I1-I3**	**5894-5725 to 5325-5207**
Sialk	**Sialk I Late Neolithic (Late)**	**V**	**I4-I5**	**5314-5205 to 5211-5003**
Sialk	**Sialk II Transitional Chalcolithic (Early)**	**V**	**II1-II2**	**5316-5206 to 4982-4973**
Ebrahimabad	**Ebrahimabad I Late Neolithic (Late)**	**II-III**	—	**5518 -5372 to 5220-5011**
Ebrahimabad	**Ebrahimabad II Transitional Chalcolithic (Early)**	**II-III**	—	**5320-5206 to 5060-4882**
Pardis	**Pardis I Late Neolithic (Late)**	**VII**	—	**5600-5200* to 5310-5080**
Pardis	**Pardis II Transitional Chalcolithic (Early)**	**VII**	—	**5280-5050 to 4830-4680**

Chapter 2: The Geographical and Palaeoenvironmental Background of the Central Iranian Plateau

2.1 Introduction

Having established the research aims and objectives, and significance of this thesis in Chapter One, Chapter Two will now provide the details of geographical and palaeoenvironmental background of the Central Plateau of Iran, thus fulfilling Objective One of the thesis. After giving a brief account of the geographical and environmental background of Iran in general, the chapter will concentrate on examining the geographical and paleoenvironmental conditions of the Central Plateau of Iran.

2.2 The Geographical background of Iran

Iran is located in the Middle East and borders the Caspian Sea, Persian Gulf, and Arabian Sea. It has four main geographical regions, namely the mountainous region, several broad basins, deserts, and low-lying plains. There are two main mountain chains, the Zagros Mountain chain, which bisects Iran from northwest to southeast and the Alburz which encircled the southern edge of the Caspian Sea, continuing eastwards to the northern highlands. These mountain ranges enclose several broad basins or plateaus, on which major agricultural and urban settlements are located, one of the most prominent being the Central Plateau of Iran which is located in centre of Iran and consists of several closed basins. The deserts or Kavirs are mainly located in central Iran and apart from some scattered oases, they are mainly uninhabited. Low-lying plains border the Caspian Sea in the north and Persian Gulf in the south (Figure 2.1).

2.2.1 Soil

Due to its climatic, topographical, and lithologic conditions, Iran exhibits a great diversity of soils. Owing to the occurrence of heavy erosion throughout the past millennia, most of the soils are lithosols. Other soils are alluvial-colluvial soils that occur in a variety of forms that can be distinguished from each other by their vegetation. The soils of Iran according their climatic conditions can be classified into humid, semi-humid and arid ones that each of them can be further subdivided into regional and interregional types (Dewan & Famouri 1964: 15).

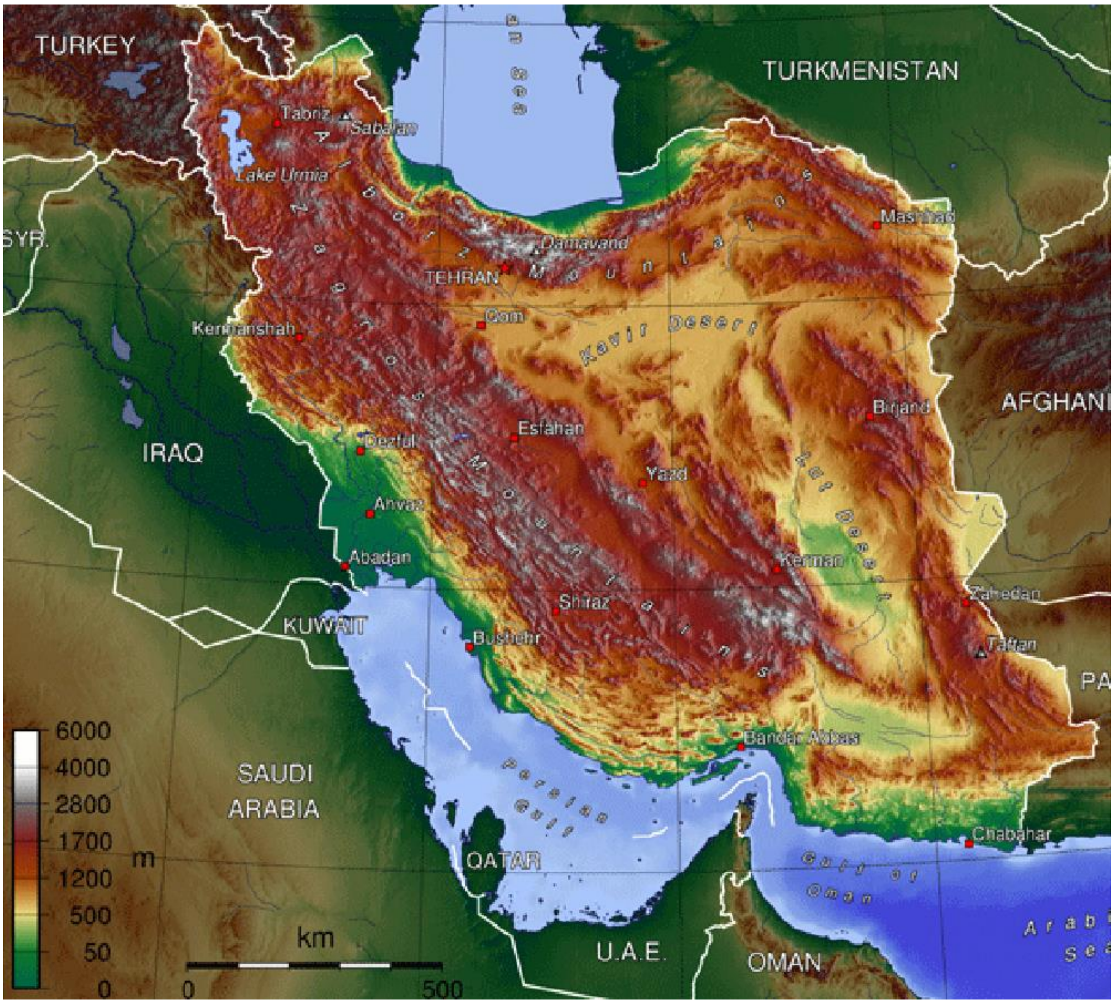


Figure 2.1 Topographic map of Iran (World of maps, 2013)

2.2.2 Hydrology

There are no major rivers in Iran and, of the small rivers and streams, only one is navigable - the 830 kilometre long Karun. It originates in the southwestern Zagros and flows south to the Shatt Al-Arub (Arvand Rūd), which drains into the Persian Gulf (Afary et al. 2006). The Sefid Rūd is another large river which originates in the Alburz Mountains and flows across the Gīlān Plain into the Caspian Sea. The largest river on the Central Plateau is Zāyandeh Rūd, which starts in the Zagros Mountains and travels 400 kilometres eastward before draining in a salt lake, located at southeast of Isfahan. There are also several other smaller rivers that drain into the Persian Gulf or the Caspian Sea (Oberlander 1968:273). Most of these are seasonal and variable but may flood in the spring, with possible devastating damages, while in summer they may altogether disappear (Afary et al. 2006). Water is also stored naturally underground, finding its outlet in springs or qanats; human-made underground water aqueducts.

2.2.3 Climate

A high percentage of the total land area of Iran is dominated by arid or semiarid climates, with annual precipitation rates from 350 millimetres to < 50 millimetres. The dry climate is mainly due to the intense solar radiation and north-westerly to north-easterly blowing winds which transport dry air masses; as well as the chains of Alburz and Zagros Mountains, surrounding the Central Plateau and preventing the atmospheric moisture from the Caspian and Mediterranean Seas entering the plateau.

Iran also exhibits a marked seasonality and locality of temperature and precipitation depending on the topography, maritime influences and seasonal winds (Brookes 1982: 192; Stevens et al. 2001: 748; Afary et al. 2006). In general, Iranian summers are hot and dry with persistent northerly winds (Kendrew 1961: 608). The average daily temperatures in the hottest parts of the country can top 43°C. January, which is almost the coldest month of the year everywhere in Iran (with exception of the Caspian Sea coasts), has a mean temperature in the range of 20 °C to -10°C. Generally, temperatures decrease over Iran from the southeast to the northwest, the northern and western parts of Iran experience four distinct seasons, whilst towards the south and east, spring and autumn become increasingly short, and some small areas experience mild winters and hot summers (Afary et al. 2006).

Iran is generally an arid county, with water surpluses existing only in the northern and western parts. The precipitation, with the exception of the coasts of Caspian Sea, usually occurs in winter. (Brookes 1982: 193; Dewan

1968: 250). The mean annual precipitation for the entire country is 400 millimetres but, as mentioned above, it is highly variable throughout the country. (Stevens et al. 2001: 748).

Various regions of Iran have been subjected to both floods and droughts throughout their history, which repeatedly devastated the city and farm communities (Melville 1984). While, vast areas in Iran are arid or semi-arid, in some regions of the country flooding has been one of the most devastating natural disasters occurring frequently. (Ghayoumian et al. 2005: 493).

This chapter focuses particularly on the Central Plateau and a more detailed study of the geography and environmental context of Central Plateau is essential in order to contextualise the region.

2.3 The Geographical background of the Central Plateau of Iran.

The centre of Iran consists of several closed basins that collectively are referred to as the Central Plateau. The average elevation of this plateau is about 900 metres. The Central Plateau of Iran has held a prominent place in Iranian cultural, technological and political development. It has been an important trade route connecting Mesopotamia, northern Iran and central Asia, with a number of settlements dating from the Neolithic to the historic period (Schmidt 1935; Kleiss & Kiani 1995: 778; Fazeli 2001: 18).

The term plateau has been used as a general term to name the whole upland masses by several American and British geographers, whereas French and German geographers used this name to call only the inner central basin of Iran. Fisher restricts the use of the term ‘Central Plateau’ to the upland area, territorially located within the boundaries of the present state of Iran (Fisher 1968: 5). His definition is used in this thesis.

The Central Plateau covers nearly one third of Iran and forms a prominent geographical region bounded by the Zagros Mountains from the northwest to the southeast, the Alburz Mountains in the north and the Kopet Dagh in the northeast. The eastern part of the plateau is covered by two salt deserts, the Dasht-i-Kavir (Great Salt Desert) and the Dasht-i-Lut. Except for some scattered oases, these deserts are uninhabited. As noted above, n the last four decades a number of scholars (Majidzadeh 1976; Voigt and Dyson (1992) and Malek Shahmirzadi 1995) have used the term Central Plateau to describe a cultural zone as well as a geographical area. The main geographic features of this region include the mountain, deserts, and plains. According to geological studies, a major tectonic line separates the Central Plateau from geological deposits to the south (Dewan & Famouri 1968: 26). Along this line, eruptive rocks such as andesite and numerous springs are present in different places. These springs have caused deposition of travertine – a form of limestone – and sediments of Palaeozoic, Mesozoic and Tertiary are also present (ibid.). Some large lakes once occupied much of the present area of the Central Plateau but today only some residential salt lakes (kavirs) or marshes exist at the lowest parts of the plateau (Fisher 1968: 92). The plateau can be broadly divided into three geographical regions: the mountains, deserts and the plains.

2.3.1 The Mountainous region

The Zagros Mountain chain is the continuation of the Caucasus Mountains. It occupies much of the western region of Iran extending from the northwest to the southeast and separates the Central Plateau from the Assyrian highlands, the lowlands of Khuzestan and southern Mesopotamia (Bulliet 2007; Zohary 1973: 15). In the south, the Zagros chain turns east toward Kerman and Baluchistan. The Zagros is also very rich in mineral resources and enclose valleys that “are well suited to small scale agriculture and/or large-scale pastoral lifestyles” (Thornton 2009: 306). The nature of the Zagros uplands begins to change markedly. For about 1200 kilometres from northwest to southeast and over an extent of 320-400 kilometres in width (Fisher 1968: 17), there occurs the principal developing of the Zagros system, with well-defined and highly characteristic features. The average elevation of the Zagros Mountains is between 2000-3000 metres, while Zard Kuh Mountain reaches 4500 metres above sea level (Fisher 1968: 17-22; Niknami 2000: 99,103). These mountain chains create a climatic border between the Central Plateau and the coastal zone of the Caspian region in the north, and the Mediterranean zone in the west by preventing precipitation from entering the interior. The average annual rainfall in the mountainous areas ranges from 400mm to 700mm while that of the interior may fall below 50mm (Bobek 1968: 286; Niknami 2000: 99-106; Fazeli 2001: 11).

The Alburz chain, a little more than 500-600 kilometres long and 60 to 120-500 kilometres wide forms a crescent open to the north (Fisher 1968: 38-60; Zohary 1973: 15). The Alburz Mountains extend between the mountains of Armenia in the west and those of the Hindu Kush in the east. It separates the Aralo-Caspian depression in the north (-26 metres) from the central Iranian uplands to the south (1,100-1,500 metres) (Bazin, et al. 1985). This high range forms an almost continuous wall, broken only by narrow defiles; it is separated from the mountains of Ṭalish in the northwest by the deep valley of the Safid Rud and linked to the mountains of Khorasan and the Kopet-Dag range in the east by the heights of Jajarm (Fisher 1968: 38; Ganji 1968: 219; Bazin et al. 1985). It constitutes a climatic and ecological barrier of prime importance in the geography of Iran. The northern slopes, rising from the plains of Gilan and Mazandaran, contrast sharply in their physical and human landscapes with the southern slopes, which are already part of Iran's arid zone (Bazin et al. 1985). The average elevation of the Alburz Mountains is 3000 metres, while its highest point at Mount Damavand reaches 5,671 metres above sea level. The mean annual temperature varies here from 14.8 to 17.7°C and the mean monthly temperature for January between 4 and 9°C (Zohary 1973: 37).

2.3.2 The Deserts

The second geographical region, the desert or kavir, is an inhospitable region, parts of which are completely inhabitable (Fazeli 2001: 19). The Central Plateau contains a number of deserts that separate and define various fertile plains. The largest, Kavir-i-Masileh, lies in the west covering a large area extending from the Ray region in the north to the Kashan region in the south. Smaller deserts are found in Semnan, Damghan and Garmsar (Wong 2008), to the south of these lies the Dasht-i-Kavir, also known as Kavir-i-Buzurg or Kavir-i-Namak. Dasht-i-Kavir as a continuous expanse covering over 320 kilometres in an east-west direction; and it is more than 65 kilometres wide in certain parts. Towards the north and west, where the

Kavir reaches to within 10 kilometres of Tehran, there is a much more gradual descent from the Alburz foothill terraces to the Kavir surface, which lies at attitude of about 914 metres above sea level (Fisher 1968: 95). The Dasht-i-Kavir is an inhospitable region characterised by bare eroded ridges and basins underlined by silt and salt crusts of variable thickness with no vegetation growth (Fisher 1968: 95-7, Niknami 2000: 99-100). Together with the Dasht-i-Lut, the desert region occupies nearly one third of the total area of the country (Oberlander 1968: 278). To the south of Tehran, the desert regions gradually separate from the plain and the city of Pishva in the east and soil types and the distribution of plants gradually change. The vegetation pattern consists of accumulated tamarisk forest (Dewan & Famouri 1968: 253) forming areas unsuitable for agricultural activities. In this area, rain is much scarcer, with an annual amount of between 100 to 50mm (Ganji 1968: 233-245).

The topography of deserts can be described as assemblage of bare, steep, rugged mountains, compound fans, and basin floors mostly comprised of mud, salt crusts or marshlands (Brookes 1982: 192). Areas of mud mostly are covered with salt crusts, hiding the deep underground channels. Some surfaces of the desert are 1-10-centimetres thick and are covered by a salty viscous mud. Hence, the structure of surface is very fragile and its sudden collapse poses a great danger. In this condition, cultivation also becomes impossible. Summer temperature rises over 50°C during the day while winter temperature can drop below freezing (Fisher 1968: 93). Because of the lack of cloud, the elevation, and the dryness of the air, there is a rapid radiation of heat from the surface at night leading to temperature extremes (Fisher 1968: 93). Although the region is not suitable for human habitation, it is favourable for wildlife, e.g. seasonal birds, which migrate from cold regions such as Siberia during the winter and the Iranian zebra, which live on the edge of the central desert (Fazeli 2001: 20).

2.3.3 The Plains

The plains are mostly covered by water-transported alluvial sediments, and encompass a number of inter-montane areas and small kavirs which can be divided into different micro-environmental zones (Fazeli 2001: 14). Alluvial fans are the most extended sediments in the plains. They are fan-shaped deposits formed where a fast-flowing stream flattens, slows down and spreads, e.g. at the exit of a valley onto a flatter plain. They are the main site of deposition in areas, in which mountains gradually wear away, through geological time and basins were filled with sediments. (Wilkinson 2003). Alluvial fans in the Central Plateau, range in size from less than one kilometre square to massive fans, such as the fans of Jajrud, measuring over 2500 square kilometres (Beaumont 1972: 251). There is always a seepage zone at the base of alluvial fans where groundwater approaches the soil surface and sometimes forms springs. The water permittivity of alluvial fans is usually high. For example, the Garmsar alluvial fan, which is located 120 kilometres southwest of Tehran, discharges water at a rate of at least 10-metres-per day (Oosterbann 2000: 4). Therefore, in arid and semiarid regions, alluvial fans are often the principle groundwater source for farming and the possibility of establishing sustainable communities in these regions. They also contain rich soils, suitable for agriculture.

The exact dating of appearance of alluvial fan sedimentations on the Central Plateau is not clear but sedimentological and geomorphological evidence suggests that the fans have been relatively stable for at least the last 750 years (Beaumont 1972: 258, 267; Gillmore et al. 2011: 51). It has been suggested that the optimum conditions for the formation of fans initiated mainly during the glacial phases of the Pleistocene. Two major phases of alluvial deposition in Iran are recognised (Vita-Finzi 1968: 951; Beaumont 1972: 269) with an earlier phase of deposition, probably beginning about 50,000 years ago and ending by the fourth millennium BC and a second phase of deposition that occurred during the Middle Ages. Due to a lack of data, it is impossible to estimate the thickness of the alluvial fans correctly. However, limited excavation on the Jajrud fan, located at a place 19 kilometres south of Veramin, revealed the existence of a fan deposit 275 metres deep but greater thicknesses might occur elsewhere (Beaumont 1972: 255-6). Such findings might have very important implications for the visibility of archaeological sites from the surface, particularly those from the earlier periods (cf. Brookes et al. 1982; Coningham et al. 2004; 2006).

The plains of the Central Plateau include Tehran in central north, Semnan in the northeast, Qazvin in the northwest, Saveh in the west, Qom in central and Kashan in the south (Figure 2.2). The water supply of these plains consists of underground water sources, perennial and seasonal rivers and springs. The average annual rainfall ranges from a low of 55 millimetres in Damghan to a high of 339 millimetres in Qazvin (Ganji 1968: 248). The climate is characterised by hot, dry summers and cold winters. Precipitation occurs mainly in winter although short and heavy rainfall can occur in summer. Snow cover may be present in winter especially in the northern regions (Ganji 1968: 234, 246-9). The mean annual temperature is about 18oC, with extreme maximum temperature reaching 44oC and extreme minimum temperature of -14oC (Niknami 2000: 106).

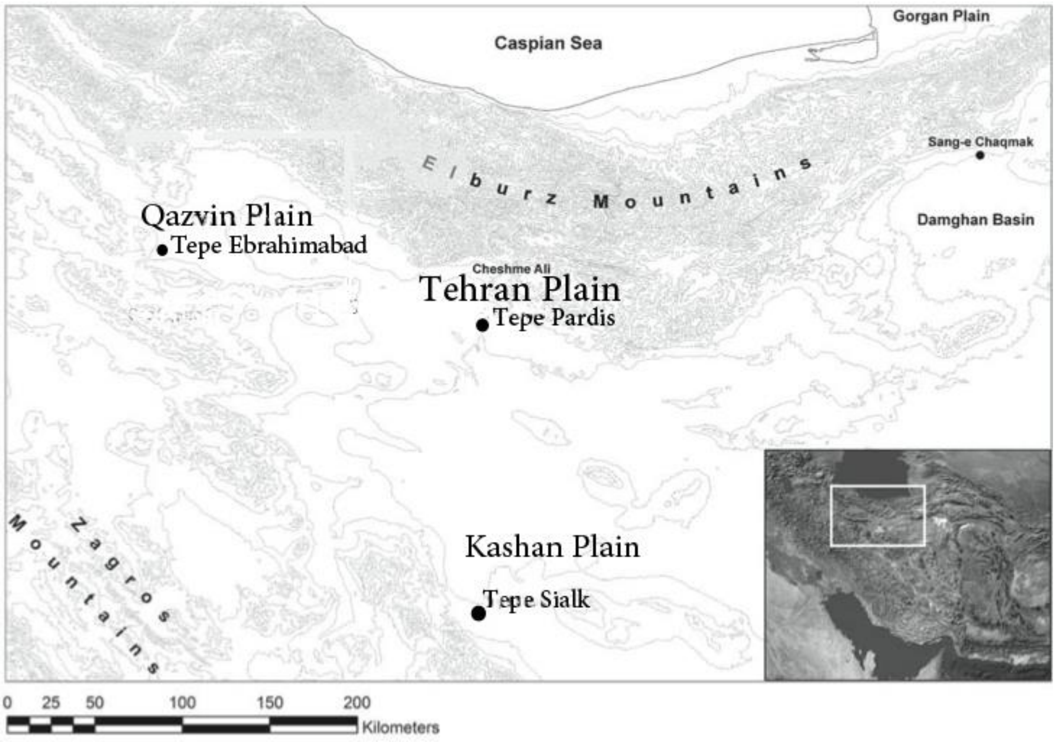


Figure 2.2 Map of Iran showing Central Plateau of Iran and the plains.

2.3.3.1 The Tehran Plain

The Tehran Plain is an area which lies immediately below the southern slopes of the central Alburz Mountains (Fazeli 2001: 10). It is a region of steep topographic relief, arid or semi-arid climates (Gillmore et al. 2007: 40).

The plain covers an area of approximately 1300 square kilometres and owes its origin to alluvial deposition in the form of a large cone, at a point where the Jajrud River leaves the foothill zone (Beaumont 1968) and it is covered with water-transported alluvial sediment. The Tehran Alluvium is a deposit of sand and silt, with horizons of gravel at all stages of rounding and with a maximum diameter of 20 centimetres. Scattered pebbles occur in the fines; bedding is most marked where sands predominate and within the gravel horizons, and is roughly horizontal. The gravels grade upwards into fines but often have a sharp base (Vita-Finzi 1968).

The Alburz Mountains to the north and east are currently being worn away continuously which lead to a supply of abundant amount of gravel and sands to the plain, creating a highly unstable geomorphological environment, “where the river channels are in constant flux and episodes of sedimentation and erosion are highly variable through time and space” (Gillmore et al. 2011: 51). Hence, alluvial deposition on archaeological sites, and their burial, is a major issue. For example, ~1.5 metres of sediments have been deposited at Tepe Pardis since the Iron Age (ibid.: 52).

The Tehran Plain is a microcosm of the Central Plateau, encompassing three major environmental zones: the southern foothills of the Alburz Mountains; the central plain proper; and the desert fringe (Coningham et al. 2006: 54). It also contains some inter-mountainous areas, such as Bibisharbano, Namak, Seh-Payeh, Algader and Hassanabad and some small salty lakes, such as the lake of Kamalieh, which divide the plain into different micro-environmental zones. Modern settlements are largely confined to the plain, but the physical characteristics of the mountains, intermountain valleys and desert are also important (Fazeli 2001: 8).

The Tehran plain receives an average annual rainfall of more than 300 millimetres (Majidzadeh 1976: 10-12; Ganji 1968: 248) which is confined to the winter months (Gillmore et al. 2009: 40). Most of the water on the plain comes from the rivers draining the highlands to the north and west, where the maximum discharge is associated with spring snowmelt (Gillmore et al. 2011: 50).

The mean annual temperatures range between 15-18 °C with the extreme maximum temperatures reaching 42 °C and the extreme minimum temperatures to -20 °C (Zohary 1973: 37). Moreover, the duration of periods of coldness and hotness is relatively long, and as a result few perennial plants, with the exception of desert and semi-desert scrub plants, can survive.The Alburz Mountains encircle the southern edge of the Caspian Sea and continue eastward to the northern highlands with a relatively narrow series of folds with extremely steep ridges generally over 2000 metres in height, but reaching nearly 6700 metres in some places (Fisher 1968). The Alburz Mountains create a climatic border between the coastal plains of the Caspian region and the great Central Plateau of Iran by obstructing precipitation from entering the interior of the country. Significantly, an annual surplus of water and seasonal surpluses occur mainly in the Alburz Mountains (Oberlander 1968: 265). The Tehran plain is irrigated by both seasonal and permanent rivers that are maintained through the rainless summer and early autumn by snowmelt that flow from the surrounding mountains, which also contributes to the water resources of springs. The main rivers of the Tehran plain are the Karaj, Shour and Jajrud. However, as a consequence of deposition of water-transported alluvial sediment on Central Plateau, as mentioned above, the river system in this region underwent a gradual shifting over time that has had considerable effect on human settlement patterns from prehistory to the present (Tehrani-Mogaddam 1996; Fazeli 2001).

Hence, irrigation has been possible in many locations through the manipulation of the many streams, rivers and springs and from the relatively widespread water-bearing layers below ground level, which enable the building of qanats. The qanat is a 'horizontal well' that appears to be of Persian origin and may date back more than 2000 years (Cressey 1958). It consists of a tunnel leading from below the water table to an outlet at the ground surface along which water moves by gravity flow (Beaumont 1968). Today, owing to the presence of both the Jajrud and its rich alluvial deposits, and the qanat irrigation system, the Tehran Plain is one of the key centres of agriculture in Iran (Coningham et al. 2006: 54; Ilkhani-Moghadam et al. in press). Farmers both in the past and present have preferred to settle on the alluvial fans that fringe the mountain ranges, due to the advantage of the water supplies in these areas. Although such areas are hazardous to live in and Melville (1984: 131-2) reports that villages are often abandoned following a disaster that permanently affected the water supply – the advantage of the water supply in the years when no disastrous flood events occurs more than compensates the risk (ibid.).

Today, quite different botanical species are recognised on the Tehran Plain. In highlands (2000-4500 metres above sea level) the remains of woodland that is largely comprised of Juniper and Ponderosa Pine trees are found, whereas in the low hills the main types of plants are Fraxinus spp., Crataegus spp. and Fircus carica but in lowlands due to the existence of the arid climate and salty soils, salt-tolerant species make up most of the plants. The dominant species in Central Plateau are the low shrub bushes, Artemisia sieberi and Artemisia aucheri, larger shrubs of Tamarix sp, Salsola, and a variety of wild grasses (ibid.).The main crops of the region are cotton, cereals, and sugar beet. Wild animal species living in the plain include gazelles, caprines, equids, foxes, camelids, and varous species of migratory birds (ibid.). Domestic animals consist of caprines, equids (horse & ass), cattle and dog (Mashkour et al. 1999: 74).

The third environmental zone is the desert basin. The plateau lies 1000m above sea level, except the salt desert Dasht-i-Kavir. This is an inhospitable region that lies as low as 500 metres with some areas completely uninhabitable. The desert topography (kavir) is characterised by a landform assemblage of bare, steep, rugged mountains with debris-strewn pediments, compound delta fans and basin floors underlined by mud, salt crusts, or marshland. Summer temperatures rise to over 50 °C while winter temperatures can drop below freezing. The vegetation consists of accumulated tamarisk forest forming areas unsuitable for agricultural activities (Fazeli et al. 2002).

2.3.3.2 The Qazvin Plain

The plain of Qazvin is located on the southern slopes of the Alburz Mountains about 250 kilometres west of Tehran and is a large alluvial basin located on the north western part of the Iranian Plateau, being bounded in the south by the Ramond Mountains and in the north by the Alburz Mountains (Negahban, 1979; Schmidt & Fazeli 2007a; Vahdati Nasab et al. 2009). The plain has an average elevation of 1175 metres above sea level and gently slopes from the north and south towards a flat plain in the centre. It covers an area of 443,200 hectares, of which ca. 310,000 hectares is cultivable (Malek Shahmirzadi 1977a: 16).

The southern part of the Qazvin plain is divided in two distinct mountain and plain zones. Mount Ramand is the highest peak at 2555m above sea level; the lowest elevation is the Boeen Zahra plain (1178 metres above sea level). The main river is the Haji-Arab, which runs even in the driest summers. There are also smaller streams such as branches of the Rud-i-Shur, Sarud and Aveh-Chai (Malek Shahmirzadi 1977b: 22). Qanats (aqueducts) have been used for water supply to settlements and irrigation in the past but many have been abandoned since the earthquake that affected the plain in 1962 (ibid.: 23-24). Cartesian wells have been dug and are used more frequently in recent years (Bocherens et al. 2000: 3; Wong 2008). The mountain ranges run in an east-southeast to west-northwest direction. The southern portion of the Qazvin plain is made of volcanic rock formations filled by sedimentary layers (Vahdati Nasab et al., 2009).

Important trade and communication routes crossed through the Qazvin plain, most prominently the Silk Road in an east to west direction, but north to south links from the Caspian Sea to Rudbar and Manjil were also important (Neghaban 1977; Schmidt & Fazeli 2007a). The plain lies in a semi-steppe/arid zone, having dry and hot summers, with temperatures rising up to 35 ºC, and cool, wet winters, with temperatures as low as 2.5 ºC (Malek Shahmirzadi 1977a: 32). The maximum annual rainfall is reported as 339.1 millimetres (Ganji 1968: 248) but it differs greatly in the north and south. Whereas, the average annual rainfall in the north is over 200 millimetres, it is less than 120 millimetres in the south. (Dewan & Famouri 1964: 80; Malek Shahmirzadi 1977a: 48). The plain is enclosed on three sides by mountain ranges but is open to the Dasht-i-Kavir which is located at the southeast section. Hence, most of the time a strong current of wind blows across the plain: a cold, dry wind blowing from the northwest; and a hot, dry wind which blows from the southeast (Malek Shahmirzadi 1977a: 32-3).

The vegetation varies according to climate and the soil type. Two main soil types exist in the plain, scattered patches of fine-textured alluvial soil and a ‘Brown Soil’ (Dewan & Famouri 1964: 142). The former alluvial soil when irrigated, can sustain extensive agriculture, it has been suggested that this may also have been practiced in prehistoric times (Malek Shahmirzadi (1977a: 29) and some dry farming is also reported.

2.3.3.3 The Kashan Plain

The Kashan Plain has an altitude of 1,600 metres above sea level and is located 240 kilometres to the south of Tehran and 220 kilometres to the north of Esfahan. It covers 7220 square kilometres in area and is located in an arid zone of the central part of Iran (Abtahi & Pakparvar et al. 2001). It can be divided into three major environmental sectors, the western mountainous region, the plain and desert. The geological formations around Kashan dominantly belong to the Cenozoic. These consist mainly of pyroclastic and volcanic rocks, and stretch from south to northwest. In the west and southwest of the Kashan basin, reddish coarse-textured sediments (conglomerates, sandstone, etc.) occur. The Karkas Mountain range (3588 metres) in the south comprises older rocks (Mesozoic), mainly shale, dolomite, limestone and sandstone. This also includes the fractured Cretaceous limestones, in which the well-known springs of the Fin and Niasar villages originate. The thickest part of the sediments (210 metres) is in the south. The depth to groundwater varies from 150 metres in the south to 1-5 metres in the north, the Sombak area in the territory of Aran-Bidgol. The groundwater depth becomes shallower towards the salt lake located south of the town of Qom. The heights south and southwest of Kashan belong to a volcanic belt, forming the Iranian central heights, which stretches to Iranian Azarbuydjan and Tabriz. Further to the north, the Latif and Yakhaub Mountain complex runs parallel to the southern heights. The lowland between these two ranges is a graben known as the Qom-Ardakan depression (Farshad et al. 1997). The annual rainfall in the Kashan plain ranges from 100 millimetres to 200 millimetres isohyets (Ganji 1968: 234; Modarres 2007; Jomehpour 2009) and within the period of 1962–92 has been registered as 134.9 millimetres, the mean annual temperatures range between 18-20°C, the difference between day and night temperatures is distinctly high, and in the summer it is as much as 15°C. It has a seasonal rainfall pattern, and cultivation is aided by both qanat systems and modern pumps. Settlements within the plain are located along qanat systems and close to natural springs (Jomehpour 2009).

2.4 The Palaeoenvironmental background of Central Plateau

As changes in environment can lead to cultural responses, such as settlement relocation and modification in subsistence strategies, the climate, soil, flora, fauna, natural resources and topography of any given region must be taken into consideration in the dating and interpretation of material recovered from prehistoric sites. In order to fulfil the aforementioned tasks, archaeology utilises palaeoenvironmental reconstructions. Such reconstructions use a number of different techniques such as studying ancient coastlines (Van Andel 1989), submerged land surfaces (shackleton & Van Andel 1986), the composition of the sediments and soils of the excavated sites (Courty et al. 1989; Gilmore et al. 2009; Schmidt & Fazeli, 2007a) and the examination of micro and macro botanical and fauna remains (Moore et al. 1992; Rackham 1994; Mashkour et al. 1999, 2002; Bocherens 2000). Unfortunately, the knowledge of past environmental events and processes in Iran is relativity poor; albeit numerous studies carried out since the nineteenth century regarding this issue. For example, there are little studies on climatic change in terms of variation in temperature, precipitation and other climatic variables that can affect the physical pattern of the land, and the nature and distribution of faunal and botanical communities. In fact, there is evidence for significant climatic changes during the late Pleistocene and early Holocene in Iran, which would have affected the land morphology (Niknami 2000: 89). Erosion and deposition are two geomorphological processes that affected the preservation of sites as well as the lives of their inhabitants. The archaeozoology and archaeobotany of the Central Plateau has also recently been receiving increasing attention providing further insight into animal exploitation and subsistence economy from the Late Neolithic period to the

Iron Age (Mashkour et al. 1999: 65-76; Bocherens et al. 2000: 1-19; Mashkour 2000: 27-42, 45-54, 2004; Fazeli & Young 2008).

2.4.1 Geoarchaeology

For the first time in the history of research in the Central Iranian Plateau, the study of soil and sedimentary sequences was implemented in 2004 at Tepe Pardis in Tehran plain. Those studies were focussed on the mapping pedological and sedimentary stragraphies through field observation and particle size distribution, allowing an understanding the geomorphology of the plain as a whole. The studies were concentrated on the exposed section of the brick quarry that was excavated in 2004 at Pardis, located on a substantial stream-dominated alluvial fan sequence. The Tehran plain is a structural basin at the southern margin of the Alburz Mountains, formed by the down warping of Palaeozoic and Mesozoic sediments and Eocene volcanic materials (Beaumont 1968). In this basin, thick Miocene beds were laid down and more recently thick alluvial deposits from the Jajrud flooding events have played a significant role in depositing large volumes of sediment in a short time period (Beaumont 1972). These sediment deposits have been generated from the watershed of the Jajrud and mainly consist of fine grained clays and silts as well as coarse sands and granules. Of particular note at Pardis was the identification of a number of sand-filled palaeo-channels within the sections, indicating the movement of water through this area in antiquity. Although most of them appear to have natural characteristics, one small channel close to the base filled with clay flakes and rip-up clasts existed. It is likely that this channel had encountered episodes of little water followed by episodes of increased flow. Located close to Late Neolithic and Transitional Chalcolithic interface levels (5220-4990BC and 5220-5030 BC) (Coningham et al. 2007), it has provided the earliest evidence of artificial irrigation in the Tehran plain. This recent research has raised the possibility of deliberate water management using canals in the Late Neolithic to Chalcolithic periods in the modern arid upland landscapes of south West Asia (Coningham et al. 2006). Such management possibly existed in an exposed 2.5 metres high sequence of early Holocene deposits at Tepe Pardis. In their study, the sedimentary infill of the irrigation channel was compared with the deposits of a modern river near Varamin. The bed of these river channels (albeit on a larger scale than the irrigation channel) was characterised by clay-flake formation. On close examination, clay flakes could be observed as repeated horizons within the irrigation channel sequence. Comparisons were also made between what is regarded as a possible managed irrigation channel and modern irrigation channels on the Tehran Plain. The triangular cross-section of the Tepe Pardis palaeo-irrigation channel was very similar in gross form to an overflow next to the aforementioned channel on the Tehran (Gillmore et al. 2007).

In the Central Plateau of Iran, extensive alluvial deposits have been responsible for partially or in some cases completely burying tell sites. For example, Tell Ghabristan (on the Qazvin Plain) is now level with the surrounding ploughed field, being buried beneath over 6 metres of alluvium (Schmidt et al. 2005). Brookes (1989) suggested that in some regions in Iran 10-12 metres of Holocene alluvial sediment had buried Neolithic archaeological sites. Whilst such a high sedimentation rate at Tepe Pardis cannot be envisaged, there is a clear indication of significant amounts of sediment being deposited since the Late Neolithic. The quantity of pollen recovered from samples was small and the pollen was also poorly preserved. Therefore, no definite conclusions could be drawn about the floral ecologies of the catchment areas.

Therefore, the small canal-like feature with triangular cross-section, (1 metre in width and 0.24 metres in depth, has been interpreted as a silted-up artificial channel with infill-deposits indicating periods of shallow relatively quiet flow and periods of drying-out. The sediments in the channel represent at least three phases of flooding. Therefore, the channel may have acted as a depository for sediments as they settled out of the flood waters. One interesting fact that complicates this picture is that no cultural material has been found to date within the channel sequence, although cultural material surround the channel. The canal and its infill sequence are distinct from the deposits beneath, adjacent to and above it. Oates and Oates (1976) pointed out that the history of agriculture in alluvium is complex and that the practice of irrigation in the alluvial plain requires a certain level of skill. The study at Tepe Pardis, together with evidence from Choga Mami, underlines the fact that 6th millennium BC farmers in Iraq, and now probably in Iran, practised irrigation.

Finally, this crucial evidence now raises the question of why population expansion and urban life did not develop more fully on the Tehran plain despite this early evidence of irrigation. Was it for example, as Fazeli (2001) has suggested, the unreliability of water resources that controlled development? The river sequences at and around Tepe Pardis site noted in the 2006 quarry surveys provide evidence of variations in flow rate, and migration of watercourses across the alluvial fan surface. One comparative Tepe site, Mafinabad to the west of Tehran, provided clear evidence of a migrating braided watercourse approximately 30 metres across, exposed in excavations for building foundations. These braided sequences contained Middle Chalcolithic pottery in abundance in one horizon, with another pottery layer below. The sequences were approximately 300 metres from the tepe, with no evidence of watercourses in the 2 metres of finer sediment exposed above (Gilmore et al. 2009). These sediments are similar in their component materials to the river sequences noted in the excavations carried out in 2007 at a field located to the west of Tepe Pardis, within the boundary of the quarry site (but without pottery remains). The horizons examined both at Mafinabad and the western channel sequence at Tepe Pardis, generally showed graded bedding, indicating a series of depositional events that decreased in strength of flow. The absence of a later watercourse in the Mafinabad sequence suggests that channels at this time were highly mobile and unreliable. Another interesting comparison can be made to the Late Neolithic tell of Wadi Faynan, Jordan (Hunt et al., 2007). There Hunt et al. noted the relationship between the position of the tell and nearby stream deposits. These deposits indicated fairly permanent flows with 5-20 metres wide and greater than a three metres deep channel. Such a relatively reliable water supply with the proximity of uplands could help to buffer society against drought. The importance of water in developing a sustainable society in marginal environments, such as those that exist today on the Tehran Plain, was highlighted by Gilbertson et al. (2000, 2009). In addition, samples were collected for the thermo-luminescence dating of river sands that had not been previously dated. This includes the large river channel to the north of the site, smaller channels that run parallel to Tepe Pardis as well as the tepe's artificial channel for comparative purposes. The latter channel has been well dated using radiocarbon measurements and ceramic comparisons, while the natural river channels have no associated charcoal remains and ceramics and are thus ambiguous (Fazeli et al. 2007a).

2.4.2 Climate

As mentioned above, the climate of the Central Plateau is heavily influenced by the Zagros and Alburz Mountain systems, which form climatic barriers separating it from the warm, moist Mediterranean weather systems to the west, and the coastal weather system of the Caspian Sea to the north. As a result, the Central Plateau is characterised by a semi-arid/arid climate, which becomes highly arid in its large and depressed centre (Bobek 1968: 280). Summers are virtually cloudless, and consequently temperatures are very high during the day, though there is wide diurnal variation due to the high elevations, dryness of air, and lack of clouds (Ganji 1968: 220). In winter, temperatures are generally low. For example, temperatures as low as -16ºC have been reported from Tehran for January, the coldest month of the year (Ganji 1968: Table 1). From February onwards, the land begins to warm up, and temperatures as high as 36ºC have been recorded in July and August (ibid. Table 2). Precipitation is limited, averaging ca. 25–150 millimetres annually, with an incidence sharply confined to the winter months (Fisher 1968: 91); and decreases from north (average rainfall over 200 millimetres per annum) to south (average less than 120 millimetres per annum) (Dewan & Famouri 1968: 250) (Tables 6.0-6.2).

2.4.3 Hydrology

There is a lack of perennial, and even seasonal streams, in most parts of the Central Plateau. Hence, the availability of water, both surface and underground, has always been a major obstacle in the way of establishment of sustainable communities in the Central Plateau of Iran.

Ghirshman writes, for example, that "at all times on the Plateau, the question of water has been vital". However, he added that "despite the extremes of climate, intense cold in winter and heat in summer, the ground yields abundantly wherever man can bring water" (Ghirshman 1954: 25). Annual and seasonal surpluses of water occur mainly in the Zagros and Alburz Mountains (Oberlander1968: 265). The rivers of this region are maintained throughout the rainless summers and early autumn by snowmelt, which also provides water for the seasonal springs. Major permanent rivers of the region are the Karaj, Talegan, Abhor, Kan, Solequn, Qazvin and Shour. Amongst them Karaj, which flows through the Alburz Mountain range, is the longest river (Fazeli 2001: 11).

2.4.4 The Archaeozoology

In contrast to the Zagros region, no systematic study of the archaeozoology of the Central Plateau was undertaken until the 1990s. Faunal studies from Zagheh, Ghabristan, Sagzabad, Chahar Boneh and Ebrahimabad by Mashkour et al. (1999), Mashkour (2000, 2002), Bocherens et al (2000) Young and Fazeli (2008) have greatly contributed to the understanding of the subsistence strategies and exploitation of animals from the Late Neolithic to the Iron Age. Mashkour (1999: 68-73) showed the presence of wild equids, caprines (both domestic and wild species), cattle (Bos taurus), dogs, boars, foxes, gazelles and birds in all three sites. Remains of domestic equids were found only in Ghabristan and Sagzabad. The hunting pattern of equids and gazelles, with a chronological increase of the former, is a characteristic of the Central Plateau (Mashkour 2000: 971), suggesting a diversity in subsistence pattern in the later prehistoric period (Mashkour et al. 1999: 74). Animal bones and plant remains from Zagheh and Ebrahimabad within the Qazvin plain indicated full domestication of animals and plants during this period (Young & Fazeli 2008; Fazeli et al. 2010). In Tepe Pardis, the low number of bones attributed to wild species such as gazelle and deer is in contrast to the results noted by Mashkour et al. (1999: 71), instead, the results showed an overwhelming domination of domesticated sheep and goat. It is also worth noting that with such a small assemblage, it is often difficult to distinguishing between domesticated and wild sheep and goat. While it is hard to determine subtle changes and developments in a small assemblage, it is clear that sheep and goat are the dominant species at Tepe Pardis. The bones from Zageh clearly shows that ovi-caprines (sheep and goat) dominate in terms of identified bone numbers

(452 bones, or 82% of the identified material), with cattle being the second most numerous species (33 bones, 6%). These two species, as could be expected, stand out in terms of numbers. From Ismailabad, the assemblage shows a similar dominance by ovi-caprines but there is a much less marked gap between sheep and goat numbers, and those of cattle. Here, sheep account for 66% of identified bone, and cattle for 17%. The Ghabristan assemblage is also dominated by ovi-caprines (308 or 62%) with cattle the second most numerous species (81 or 16%). In terms of cattle and sheep/goat, it is clear that these two types dominate the assemblages from all three sites. It is interesting to note that while at Zageh, sheep and goat account for 82% of all identified bone, at Ghabristan and Ismailabad, sheep and goat account for around two-thirds of the assemblages (62% and 66% respectively), with the percentage of cattle bone from these two sites is nearly three times that of Zageh (Young 2007).

The animal bones were recovered from Tepe Pardis by hand and through sieving during excavation and in general were very fragmented. In term of identified bones, the vast majority from one of trenches came from sheep or goat, with a much smaller number of bones from both cattle and pig, and very few bones from gazelle, equids, fowl and dog. While, another trench had far fewer animal bones recovered overall, and of those identified, sheep and goat dominated the assemblage, with two bones from fowl and one piece of bivalve shell. A large number of wood charcoals were recovered from Tepe Pardis, including Oak family (Quercus spp.) and pine family (Pinus spp.). Both pine and oak trees are temperate species and are likely to be present in the area, indeed, pine pollen has also been recovered from the site (Coningham et al. 2006).

The bones from Ebrahimabad were quite fragmented, making identification of the element and species difficult. Out of a total of 11,823 bones and bone fragments recovered, 1,018 (9%) were attributed to skeletal element and animal type. Burning was also noted on a number of bones and bone fragments; 12% of the identified bones, and 18% of the unidentified bones were burnt, suggesting that they had either been exposed to fire during processing, or included in waste that was being burnt. There are three major, or dominant animal types in the identified bone assemblage from

Ebrahimabad; sheep/goat, cattle, and equids. Sheep and goat, or caprines, clearly account for the greatest number of identified bones, making up 74% or three-quarters of all bones identified. It has been possible in some instances to differentiate between the two species but in the above report the figures for each has been combined as one count. Cattle are the next most numerous types, making up 12% of the assemblage, and equid comprise 10% of the assemblage (Young & Fazeli 2008; Fazeli et al. 2010). Perhaps the most interesting trend apparent from this preliminary examination of the animal bone assemblage from Ebrahimabad is the low number of wild types recovered and identified, apart from the equid remains. Very little gazelle or deer were noted, and although some of the sheep and goat were thought to be wild, they make up a very small percentage of the sheep/goat total count. There is also a narrow range of types identified here, which suggests that this is a site with a relatively specialised pastoral base (Zeder 1991). Sites with very high counts of wild equid species have been interpreted as specialised, even marginal sites, for example Tall-i Mushki in the Marv Dasht region of Fars which has been interpreted as having had an economy based on equid hunting (Alizadeh et al. 2006: 101-105; Nishiaki 2010). The animal bone assemblage from Ebrahimabad indicates an economy firmly based on the husbandry of sheep and goat, with cattle and equids also of importance.

2.4.5 The Archaeobotany

The history of vegetation and archaeobotany in Iran is poorly understood and only limited indirect palaeoclimate data exists for the Holocene in Iran (Djamali, Beaulieu et al. 2008: 413; Schmidt et al. 2011: 587).

The best data for the Central Plateau come from the lake cores of Urmia and Zeribar Lakes, which are located in the Zagros Mountains, approximately 300 kilometres apart. Both pollen and sedimentological studies have been published concerning Lake Urmia (Bottema 1986; Kelts & Shahrabi 1986) and indirect palaeoclimate records are available from Lake Zeribar which is based on sediment chemistry (Hutchinson & Cowgill 1963), pollen (Van Zeist & Bottema 1977), palaeoliminological indicators (Griffiths et al. 2001; Wasylikowa et al. 2006), diatoms (Snyder et al. 2001) and stable isotope patterns (Stevens et al. 2001; 2006). These studies indicated that due to the increase in temperature during the Late Glacial-Early Holocene transitional period, the establishment of grass-dominated lands became possible, with few oak and various pistachio trees (Stevens et al. 2001: 751-2; Kehl 2009: 10; Schmidt et al. 2011: 587). Pistachio trees are more drought resistant than oak trees, hence they became the dominant species due to the limited moisture availability in the region (Schmidt et al. 2011: 588). Following this period, the temperature and aridity gradually decreased throughout the Early to Mid Holocen. This had resulted in a marked decrease in pistachio by ca. 6200 yr BC, and a gradual, then sharp, increase in oak (Smith et al. 2001: 453; Schmidt et al. 2011: 587). At Lake Zeribar, oak forests reached their greatest distribution at 4750 BC, and then steadily decreased to reach their pronounced depression in 2550 BC. By the early fourth millennium BC, modern climatic conditions had been established (Smith et al. 2001: 453; Djamali, Beaulieu et al. 2008: 128; Kehl 2009:10). The seasonality of the climate of the Zagros Mountains is determined by the interactions of rain-bearing clouds from the Mediterranean, with the Siberian cold weather in winter that blocks their progress, and hot winds blowing from the Central Plateau in summer which deflect the rain-bearing clouds along the western foothills and mountain range (Schmidt et al. 2011: 588; Stevens et al. 2006).

The onset of Transitional Chalcolithic period in Central Plateau (ca. 5000 BC) generally coincides with the information obtained from Lake Zeribar indicating an increase in oak pollen, and moisture, after ca. 5500 BC (ibid.).

The study of lake cores can also give useful information which can be utilised in the reconstruction of past vegetation patterns. Pollen analysis of lake cores from Zeribar and Mirabad located in the Zagros Mountains, suggests that at the beginning of the Holocene, the area now occupied by the two lakes was dominated by an Artemisia steppe (Wright et al. 1967: 441). The climate of this region became warmer and wetter around 9500 BC. This condition was more suitable for the expansion of oak-pistachio savannah, and by ca. 3500 BC this area had thickened to become the oak woodlands which still are present in the region. (Wright et al. 1967: 441; Vita-Fenzi 1968: 967; Kehl 2009: 10). In north-eastern Iran, the analysis of cores from Lake Urmia showed a similar pattern (Bottema 1986: 241;

Djamali, Kürschner et al. 2008: 68). The area around Lake Urmia until around 7000 BC was mainly occupied by Artemisia steppe; but in 7000–6000 BC the forest-steppe gradually replaced it and by ca. 5000 BC the forest-steppe had developed into open forest (Bottema 1986: 241, 256; Djamali, Beaulieu et al. 2008: 419). The modern vegetational cover on the Central Plateau was divided into two groups: the first group located within the 250-300 millimetres precipitation isohyet (the minimum for rain fed agriculture); (Bobek 1968: 288) and the other group in areas which receive less than 250 millimetres precipitation annually. Within the first group (250-300 millimetres precipitation), two main plant species can be distinguished: gacanthic or astragaleta types, with spiny bushes or brushwood of tragacanthic or other species, together with other low bushes and varous grasses and herbaceous types. Outside the limits of potential rainfed agriculture, the steppe thins out with no considerable change in its vegetation. There is also an intermediate zone, the 'desert-steppe', where patches of bare-ground become considerable, before finally turns into the true desert in which bare ground predominates.

The main vegetational pattern of the southern slopes of the Alburz at the present time, is a cold-resistant type known as 'Juniper Forest' consisting of low trees of Juniperus polycarpos, shrubs and trees such as pistachio, almond berberis and maple. In spring and autumn thorny bushes, poppy, alfalfa, gum, camel thorn, tamarisk and triticum may grow (Bobek 1968: 287; Niknami 2000: 108; Fazeli 2001: 15). The interior slope of the Zagros chain is covered by a dry forest type known as the 'Pistachio-Almond-Maple Forest' which is less dense than the 'Juniper Forest'. The ground cover is made up of a steppe complex consisting of low bushes and shrubs. Regions with lower elevation in the inland plateau have a similar pattern with the absence of maple and juniper. The flora is dominated by Artemisia herba-alba and other brushwood and grasses (Bobek 1968: 283-7; Zohary 1973: 6; Nikamni 2000: 108).

During the excavations at Chahar Boneh and Ebrahimabad, samples of soil were removed from all contexts containing cultural deposits, in particular ash layers, burnt soil, pits and hearths for flotation. Light and heavy fractions were separated and gathered, and all plant samples were examined and reviewed by stereomicroscope. Samples were then classified into domestic grains groups such as feed plants, corns, and wild grains. A small number of seeds and burnt coal residues were recovered from Chahar Boenh, including Triticum dicoccum, Triticum free threshing, Hordeum, six-row barley as well as small legumes. Other cereal seeds were obtained but were unrecognisable as they had been too badly damaged by burning and breaking. A larger amount of wild plants were identified compared to domestic varieties, with 93 wild species were identified including Gramineae, chenopodiaceous, large Compositea, Crucifera, and Aegilops. Chahar Boneh appears to be a seasonal settlement, with the absence of architectural phases and limited evidence of occupation (Fazeli et al. 2010). The deposition of alluvial sediments between cultural layers is suggestive of intermittent flooding, and the presence of water-loving plants supports such a hypothesis. Furthermore, very few agricultural tools were recovered from the site itself. As such, it is likely that the site lacked systematic agricultural organisation. The archaeobotanical data indicates the presence of only a small amount of cereal and food plant remains, a small amount of wild species, as well as the presence of moist-loving wild plants, and an absence of agricultural stone tools.

2.5 Conclusion

Chapter Two set out a foundation for the study and completed Objective One of this thesis, presenting an environmental context for the Central Iranian Plateau, upon which to build the methodology for this thesis. This chapter also focussed on the geography, palaeoclimate, zooarchaeology and palaeobotany of the Central Plateau of Iran. The next chapter will provide a brief overview of the archaeological research that has been carried out on the Central Plateau, which has focussed upon the Late Neolithic and Transitional Chalcolithic periods. Chapter Three, as indicated above, also contains information to contextualise the excavations at the Late Neolithic and Transitional Chalcolithic sites in Central Plateau – the sources of the ceramic assemblages studied here.

Chapter 3: the history of archaeological research in the Central Plateau of Iran

3.1 Introduction

The previous chapter, Chapter Two, has fulfilled the Objective One of this thesis by presenting the geographical and paleoenvironmental background of the Central Plateau of Iran. Chapter Three will now review prehistoric archaeological research in the region's Late Neolithic to Transitional Chalcolithic periods, thus fulfilling Objective Two. In this chapter, a brief history of archaeological research in Iran will be given first, followed by a review of previous chronological studies of the Central Plateau of Iran during the Late Neolithic and Transitional Chalcolithic periods.

3.2 The history of archaeological research in Iran

The history of archaeological research in Iran can be divided chronologically into two periods: before and after the Second World War. The early period can, in turn, be subdivided into a first phase of mainly French activity (ca. 1884-1931) and a second phase in which archaeology in Iran became a multinational affair (1931-40) (Young 1987: 281). The post-war period can be subdivided into three periods: an early period which best might be called the "beginning of modern phase" (1940-57), the two decades before the Islamic Revolution (1958-78) and the post-Revolution period (1990s to present). After a brief review of the history of archaeological research in Iran, this section will focus on previous archaeological studies of Sialk I and Sialk II periods in the Central Plateau of Iran.

3.2.1 The French archaeologist activity

Exploration in Iran started with European travellers and missionaries, who came to Iran and visited historical monuments from the fourteenth century AD onwards. As early as the 17th century, a number of European travellers reported with surprise on the remarkable ancient monuments to be seen throughout the countryside (Mallowan 1973: 25; Young 1987: 281). The first scientific and scholarly attempt to deal with such monuments, however, was Rawlinson’s recording of the Bisotun inscription (1836-41). While hardly a prehistoric project, that effort resulted in the decipherment of Old Persian, Elamite, and Akkadian cuneiform and quickened interest in ancient western Asia and in the history and prehistory of Iran. The next effort of note is the work of Flandin and Coste, who between 1843 and 1854, recorded numerous standing monuments and sites in both words and drawings. At the same time, the first actual excavations were undertaken by Loftus, who recovered remains on the Apadana mound at Susa (1851-53) (Young 1987: 281). The starting point of Iranian archaeology was the same as for other Near Eastern archaeological research which related to western scholarship interests; firstly to discover the lost civilisation of the Bible Lands and then to export and display interesting objects in museums (Niknami 2000: 5). The period from the start of systematic excavations at Susa in 1884 until roughly 1931 has been identified as a “French monopoly” and efforts were made to keep other foreign missions out of the country. The first French archaeologists, led by Marcel and Jane Dieulafoy, started their excavation work for the first time in Susa between 1884 and 1886 (Young 1987: 281). In 1897, the government committee in charge of French scientific and literary assignments, assigned Monsieur de Morgan, the former director of antique objects in Egypt, to undertake excavations of ancient monuments in Iran. Monsieur De Morgan travelled twice to Iran under the Qajar kings and, during each trip, he took away valuable collections of ancient relics to Paris. He remained for a long time at Susa between 1897 and 1908 (Trigger 2006: 72), from which the expedition led by Marcel Dieulafoy had departed six years earlier (Gholi Majd 2003: 2-3). He also excavated at Cheshmeh Ali in 1912, which was again excavated in 1924 by Dayet, a French diplomat based in Tehran (Vanden Berghe 1959: 121).

3.2.2 The Multinational archaeologist activity

The second phase of the Early Period of Iranian archaeology began in 1931 with the end of the “French monopoly.” Two non-French expeditions had actually predated this phase as Aurel Stein conducted some surveys and excavations in Sistan in 1915/1916 and Ernst Herzfeld made a general reconnaissance survey in 1905 before conducted a remarkable trip of discovery through western Iran in 1925/26, and some excavations at Pasargadae in 1928. Extensive excavations sponsored by numerous institutions, mainly based in the United States, however, began only in the early 1930s. Three expeditions focussed attention on Gurgan and the northeast corner of the plateau (Young 1987: 281).

The University Museum of the University of Pennsylvania sponsored excavations at Turang Tappeh from 1931 to 1932 under Frederick R. Wulsin and under Erich F. Schmidt’s at Tepe Hissar in between 1931 and 1932 and at Ray from 1934 to 1936 (Abdi 2005: 59). The Swedish expedition under T. S. Arne to Shah Tepe in Gurgan revealed an early 5th and 3rd millennium B.C. painted pottery culture underlying 3rd and early 2nd millennium plain gray wares. G. Langsdorf excavated at Bakun near Persepolis in 1932 for the Oriental Institute of Chicago and discovered yet another corpus of painted pottery that had cultural connections with prehistoric Susa. Stein surveyed and sounded selected sites in Baluchistan and Fars between 1932 and 34, while Schmidt carried out the first aerial survey in the Zagros Mountains between 1935 and 36, and led one of the first expeditions to Luristan in 1934 and 1937. The latter effort revealed materials of both Bronze and Iron Age date and was inspired by the chance discovery and clandestine excavation of the famous (or infamous) Luristan Bronzes, which first began to appear on the European art market shortly before 1930 (Young 1987: 281).

3.2.3 The Beginning of modern phase

After a decade long hiatus associated with the Second World War, archaeological activities in Iran recommenced gradually in 1946. The French Mission returned to Susa under the direction of R. Ghirshman, although his main focus from 1951 to 1962 was the excavation of the Elamite ziggurat at Chogha Zanbil. In 1949, Mahmoud Rad and Ali Hakemi led an expedition on behalf of the Archeological Service of Iran to Hasanlu south of Lake Urmia, where Stein's brief excavation in 1936 had revealed Bronze Age painted pottery and Iron Age graves (Young 1987: 281; Abdi 2005: 65).

More fieldwork was undertaken by scholars between 1958 and 1978 than had been undertaken in all the years between 1884 and 1958. Indeed, the record is so full of activity that, it is impossible to list even the most substantial excavations and surveys or those projects which produced truly significant results (Young 1987). There were expeditions from Great Britain, Japan, Italy, West Germany, Denmark, Belgium, Canada, and Austria as well as from France and the United States but, most notably, American archaeologists started problem-oriented and hypothesis testing approaches, mainly focused on the Neolithic period (Niknami 2000: 5). In addition, the Archaeological Service of Iran, now an established organisation, contributed considerably to archaeological fieldwork in Iran (Abdi 2005). In the early 1970s, E. O. Negahban as the Director of the Institute of Archaeology of Iran, instigated excavations at Sagzabad as part of a long-term project of archaeological research in the Qazvin plain that continued until 1979 (Negahban 1977, 2003). The project included the excavations of the mounds at Ghabristan, Zagheh and Sagzabad and a survey of the Qazvin plain.

3.2.4 The Post Islamic Revolutionary Period (1990s to present)

The Revolution of 1979 and the ensuing Iran-Iraq War of 1980-1988 put a halt on all excavations within Iran. Since 1990, archaeological activities have increased considerably. Several large-scale national projects involving survey, excavation, and conservation were designed, only two of which, Hamedan and Soltaniyeh, are now operating on an annual basis. In addition, some projects of smaller scale, including excavations at Bandiyan, are now operating on a regular basis (Abdi 2005: 71). After more than a decade of inertia in domestic and foreign archaeological activities in Iran following the 1978 revolution (Alizadeh 1995), in 1995 a joint Iranian Cultural Heritage Organisation (ICHO) and Oriental Institute of the University of Chicago expedition recommenced surveys in north western Fars. In so doing, the process of momentous discoveries of the beginning of village life in lowland Susiana that was interrupted in 1978, (Alizadeh 1995) again began with a joint excavation at Chogha Bonut in Susiana in 1996, and a joint Iranian-

German excavation at Arisman in 2000. Between 1997 and 2002, Cheshmeh Ali, Zagheh and Ghabristan were also excavated by Fazeli of the University of Tehran and a settlement survey of the Tehran plaincarried out jointly by the University of Tehran and the Cultural Heritage Organisation of Iran. The results of the settlement survey and the re-excavation of Cheshmeh Ali were the subjects of a PhD dissertation by Fazeli (2001), in which he investigated into craft specialisation and social complexity in the Tehran plain in the Late Neolithic and Chalcolithic periods. Other projects that have produced preliminary reports in the north Central Plateau include Ozbaki and Arisman (Majidzadeh 2001, 2010a, b; Chegini et al. 2004).

3.3 The review of Prehistoric archaeological research in the Late Neolithic and Transitional Chalcolithic periods in the Central Plateau.

Systematic archaeological research in the Central Plateau began in 1931 with Erich Schmidt's excavation of Tepe Hissar (Schmidt 1937). Tepe Hissar, located in northeast Iran near the modern city of Damghan, was occupied from the late 5th to the early 2nd millennium BC (Dyson & Howard 1989; Thornton et al. 2009; Schmidt 1937; Roustaei 2007). It did not contain the earlier cultural phases of the plateau and, in the absence of clear architectural remains, its excavator - Erich Schmidt, was unable to establish a detailed stratigraphy (Majidzadeh 1978).

Since that time, both foreign and Iranian archaeologists have been engaged in the study of historical, cultural, technological and socio-political development of the Central Plateau and a number of chronological models have been proposed. The earlier studies such as Ghirshman (1938), McCown (1942), Dyson (1965, 1987), Majidzadeh (1976) were largely culture-historical and focussed predominantly on stylistic changes in ceramics. More recent research, such as Fazeli (2001) with extensive use of petrographic study of pottery has allowed further refinement in the technological development of the region. The recent excavations of the sites of Cheshmeh Ali, Zagheh, Ghabristan, Pardis, Ebrahimabad and Sialk (Mashakour et al. 1999; Fazeli & Djamli 2003; Fazeli et al. 2004, 2005, 2007a,b,c, 2010; Coningham et al. 2006) were conducted with stricter control on stratigraphy combined with the use of radiocarbon analyses for absolute dating, thus brining additional information of crucial importance to the chronology and cultural development of the north, north western and south region of the Central Plateau of Iran in the Late Neolithic and Chalcolithic periods (Wong 2008).

During the Second World War, most fieldwork in Iran stopped but this allowed the development of substantial post-excavation analysis. For example, McCown used data from the sites of Sialk, Hissar and Cheshmeh Ali to propose a new cultural sequence for the Central Plateau. Thus when Frankfurt held a seminar on the Old World Chronology in 1942, McCown presented a paper entitled 'The comparative stratigraphy and chronology of Iran' (McCown 1954; Fazeli 2001: 115). McCown provided the first synthesis of the relationships among the early cultures of northern Iran, which shared a tradition of painted pottery. These included Sialk I-III, Cheshmeh Ali I A and B, Early and Late Anau I and Hissar I. He divided the periods into Sialk culture, Cheshmeh Ali culture and Hissar culture and further distinguished them from the buff-ware cultures in the southwestern Iran, which included Giyan V, Susa I, Tepe Musyan and other sites in Khuzistan and Tall-i-Bakun and other sites in Fars. The materials were then compared to the Halaf, Samarra and Ubaid cultures in Mesopotamia. Hissar II and III, Sialk IV, Shah Tepe, Tureng Tepe, Anau II and III were considered to be later cultures (McCown 1942). His work relied heavily on published stratigraphy and ceramic forms, styles and decorations but provided the first integral chronology study of early Iran.

After the Second World War, Willard Libby disseminated his radiocarbon dating techniques in 1949 (Renfrew 1973). This led to the broad use of absolute dating at the prehistoric sites of Mesopotamia and allowed archaeologists to date the spread of agriculture in the hilly flanks of Zagros (Ehrich 1992). As already noted, after the Second World War archaeological research in Iran entered a new stage and many sites were excavated and surveyed. In the second edition of 'The Chronologies in Old World Archaeology' McCown's paper was replaced by one by Dyson (Dyson 1965). The cultural sequence of Mesopotamia was used as a basis for comparison by Dyson in his synthesis of the chronology of Iran (Dyson 1965: 217; Fazeli

2001: 115). These horizons included: 1. Soft Ware Horizon (7th millennium BC), 2.Jarmo-related Horizon (6200-6000 BC), 3.Hassuna-related Horizon (6000-4800 BC), 4.Halaf-related Horizon (4800-4500 BC), 5.Ubaid-related horizon (4500-3500 BC), 6.Uruk-Jamdat Nasr-related Horizon (3500-2800 BC), 7.Early Dynastic-related Horizon (2850-2450 BC), 8.Northern Gray Ware Horizon (2450-2000 BC) (Dyson 1965: 217-236, 249).

For the Central Plateau's sequence, the various sub-phases of Sialk, as described later in Section 3.3.1, were related to Mesopotamian "horizons". For example the sub-phases 1-3 Sialk I was considered to be related to the Hassuna Horizon (5000-4800 BC) through "design (but not shape) parallels" (Dyson 1965: 236). Sialk I4-5 was compared to the Halaf Horizon (4800-4500 BC), Sialk II to the Halaf-Ubaid 3 Horizon (4500-3900 BC), Sialk III to Ubaid 4 – Uruk Horizon (3900-3000 BC) (Dyson 1965: 236-7, 249). While parallels between the phases of Hissar and Sialk were discussed (Dyson 1965: 238-9; Wong 2008), the approach reflects the centrality of c in archaeological thought of the era. Nonetheless, Dyson (1965: 221) astutely pointed out that the major problem in Iranian chronological discussions was "the tendency to rely almost exclusively upon design parallels to the exclusion of shape, non-ceramic objects, and basic technology" (Wong 2008: 23).

From the 1970s onwards, Iranian archaeologists proposed their own chronology for the Central Plateau with 'types' and 'cultures' primarily being indicators of temporal and spatial relations between different cultural groups. Paralleling McCown's model (1942), Negahban proposed a relative chronology for the prehistory of the Central Plateau and proposed a continuation in site occupation between the three sites of Zagheh, Ghabristan and Sagzabad (Negahban 1977; Fazeli 2001).

Negahban divided the prehistoric chronology of Iran, which was defined by their colour and decoration, into eight stages, which included: 1.The earliest settlements of Iran, 2. Civilisations before Sialk civilisation, 3. Civilisation of Sialk, 4. Civilisation of Cheshmeh Ali, 5. Civilisation of Hissar, 6. City state period, 7. Proto-literature, 8. Proto-history (Negahban 1996, 350).

Majidzadeh, suggested a further model for the chronology of the Central Plateau. He assumed that Zagheh was a key site to study the origins of the

Neolithic culture in the Central Plateau and used geographical terminology for the cultural sequence. He divided the Central Plateau prehistory into four distinct periods Archaic Plateau, Early Plateau, Middle Plateau and Late Plateau. Based upon the cultural-historical approach, Majidzadeh proposed a model in order to explain the changes in societies and settlements abandonment during the Early and Middle Plateau. He suggested that there were two intrusive elements in the prehistory of the Central Plateau, the 'Plum Ware People' and the 'Grey-Ware' phase at Ghabristan and suggested that migration or abandonment took place in the Central Plateau between the Early to Middle plateau (Majidzadeh 1981, 2008; Fazeli 2001: 116).

Malek Shahmirzadi proposed four stages for the cultural sequence of the Central Plateau based on characteristics of Ceramic: 1. Formative period, 2. Zagheh period, 3. Cheshmeh Ali period (Sialk I and II) and 4. Wheel-made pottery period (or Sialk III) (Malek Shahmirzadi 1995). He suggested that the inhabitants of Mehranabad in the Tehran plain were the first human population of the formative period. The second stage began with the introduction of Zagheh ceramic type at Zagheh. He also suggested that the cultural materials of Sialk I and II display one period rather than two periods. Moreover, Malek Shahmirzadi attempted to find the origins of culture based on ceramic diversity. He believed that new groups migrated into the Central Plateau and instigated ceramic manufacture. Later, this new innovation spread throughout the region, beyond the plateau. However, Malek Shahmirzadi assumed that some settlements independently started the manufacture, and then diffused their invention to the other areas (Fazeli 2001: 119). The following section focuses on the previous chronological studies (Late Neolithic and Transitional Chalcolithic periods) in the Central Plateau of Iran.

3.3.1 Tepe Sialk

Tepe Sialk is located on the Kashan plain in the middle of an extensive accumulation glacis sloping from the southern heights towards the salt lake. The spring of Fin is exposed in the upper part of this glacis and visible from Tepe Sialk. The soils are stratified, with layers of sand and gravel alternating with sandy loam to clay loam and, in places, lenses of clay. These soils are members of the coarse loamy, mixed, thermic Typic Torrifluvents (Farshad et al. 1997).

The tepe itself consists of two mounds, North and South, some 600 metres apart (Figure 3.1) was first excavated by Roman Ghirshman in 1933. During his original excavations on the North Mound, which contains the earlier cultural deposit of Sialk I and II (Figure 3.2), Ghirshman excavated three large open trenches (I, II and III) with deep sondages placed in the first two in order to reach virgin soil. He did so at a depth of 14 metres from the top of Trench II. Tepe Sialk has been central to any attempt to define the prehistoric chronology of the Central Plateau of Iran, partially due to the 14 metres deep Late Neolithic and Transitional Chalcolithic deposits along with mud brick structures and objects of copper and marine shell. Ghirshman also demonstrated that there was a gradual development at the site from the Late Neolithic, with cultural continuity demonstrated through ceramics and architecture. He divided the site into two main phases, Sialk I (Late Neolithic), Sialk II (Transitional Chalcolithic). These periods were primarily defined according to architectural remains, predominantly the presence of pisé walls, and burials (Ghirshman 1938). The lowest level of the North mound at Tepe Sialk, called Sialk I. Ghirshman proposed five sub- phases (1-5) for Sialk I and divided the ceramics into the four main groups: 1. Black on cream, geometric decorations on both interior and exterior surfaces, which is occasionally polished, 2. Black on red or monochrome in the early phases but decorated with geometric motifs similar to the Light Ware in later phases, 3.Black Ware, 4.Coarse Ware, undecorated (Ghirshman 1938: 11).

Whilst, many people have been content to foollow Ghirshman’s published categories, in 2001 the Sialk Reconsideration Project, led by Malek Shahmirzadi, began a five-year program of excavations to confirm the site’s sequence (Malek Shahmirzadi 2006). After publishing five volumes, Shahmirzadi’s team have demonstrated cultural continuity from Sialk’s deep prehistoric sequence on the North mound to the large monumental Iron Age structures on the South. The Sialk Reconsideration Project also identified a number of sites within the vicinity of Sialk, focussing upon the plain and foothills of the Karkas Mountains. However, there was still a lack of absolute dates from Sialk, and a continued lack of detailed information regarding the social and economic transformations of the inhabitants of the Dasht-i-Kashan.

Malek Shahmirzadi (1995, 2011) suggested that Period I and II should be considered a single period, because many of the features of Period I continued into Period II. In the later sub-phases of Period II, Red Ware with the appearance of animal motifs was the predominant pottery.

The shapes of the high cups of Period II (Ghirshman 1938: pl. XLV S.1552) and open bowls (Ghirshman 1938: pl. XLVI S.1747) are foreshadowed in the Red Ware of Period I (Ghirshman 1938: pl. XXXIX S.1647) although a small number of new forms are also present, such as bowls with inverted rims (Ghirshman 1938: pl. XLVII A2, C2) and thickened, modelled rims (Ghirshman 1938: pl. XLIV A2, C2). Essentially, the fact that ceramic industry of Period II was a continuation of Period I, with an improvement in firing condition, inspired Malek Shahmirzadi (1995, 2011) to suggest that Period I and II should be considered one (Wong 2008). Tepe Sialk was re-excavated by Fazeli & Robin Coningham between 2008 and 2009 (Fazeli et al. 2013) as a joint project between the University of Tehran, Iranian Cultural Heritage, Handicrafts and Tourism Organisation, British Academy and the British Institute of Persian Studies. One trench were excavated, reaching a depth of 16.15 metres and showing stratigraphic sequences that exhibit a pattern of change through time without any major disruption from the Late Neolithic to the Transitional Chalcolithic period (Figure 3.3). Project aims were realised through a methodology of excavation and analytical analysis. The absolute chronology of the northern mound of Tepe Sialk was established by cutting back Ghirshman’s Trench II (Tr. V) and trench VI is located at the base of Ghirshman’s Trench II to the west of his original sondage, and was aimed at sampling the earliest occupation levels at the site. The aim of Trench VI was to open a small (2x1metres) trench in order to obtain samples for dating, and to expand the artefactual typologies into the Late Neolithic period. Ceramics were divided into the eleven main groups: 1. Sialk I ware (black on buff & red on buff ware), with geometric decorations on both interior and exterior surfaces, 2.Simple black ware, 3.Simple buff ware, 4.Simple red ware, 5. Simple dark red ware, 6.Painted dark red ware, with geometric decorations on both interior and exterior surfaces, 7.Crusted ware, this type of ceramic with fine sand covering the exterior of the vessels, while, the inside was coated with a fine slip, was firstly found at Zagheh (Malek Shahmirzadi 1977) and named as Zagheh Standard ware, 8.Sialk II (Cheshmeh Ali) ware.

The first six groups are characteristic of the Late Neolithic, whilst the latter two are more typical of Transitional Chalcolithic. However, it is important to note that Simple Buff and Simple Red Ware occur during both the Neolithic and Chalcolithic periods, from the depth of 100 to 530 centimetres, numerous pieces of Transitional pottery were found.

During the 2009 excavation season at Tepe Sialk, a cluster of six burials were excavated in the Late Neolithic strata (the Sub-phase 1). In five cases, bones were buried in vessels, only Context 5103 was a plain pit grave with a fill abundant in sherds. The burials were located under house floors and no burial objects were found with the skeletons. Though, cremation was very rare in all periods in the Near East, the existence of this type of funeral ceremony was evident at Sialk. The closest parallel to the cemetery excavated at Tepe Sialk are several burials from Yarim Tepe II in northern Iraq, dated to the Halaf period (Merpert & Munchaev 1987) however, the distance in time and space precludes any direct connection between these sites. Obviously, cremation at Tepe Sialk was not accidental although burial customs must have been quite variable. Bodies of all adult individuals had been burned, but some infants were cremated and some were buried without burning. The use of red ochre, although frequent, seemed to maintain no recognisable pattern. In two cases fragments from various body units were mixed (or at least no pattern was revealed), but in two individuals (C5110 and C5113) the rough sequence of collection of bone fragments from the extinct funeral pyre may be reconstructed; in both skull fragments were located on top. One double burial C5113 contained a cremated adult individual and some bones from an unburned skeleton of an infant above, without evident articulations and thus most likely in secondary context (Sołtysiak 2010). It is virtually impossible to reconstruct any aspect of a local population with such small sample of cremated individuals. There is no indication that the cemetery was exclusive in any way as there were remains of all age classes and perhaps both sexes.

3.3.2 Tepe Cheshmeh Ali

As ntoed above, research intyo the chronology of the Central Plateau began in the 1920s with the excavations at Cheshmeh Ali. It is a small Neolithic and Late Chalcolithic mound located in the suburbs of Tehran in the north of the Central Plateau of Iran. The 7 metres high mound is located beside the spring, which provides the site with its name. It once covered an area of over 3.5 hectares, abutting a rocky ridge at the edge of the Islamic city of Ray (Schmidt 1935; Fazeli et al. 2004,). Monumental remains also identify a significant role for the site during the Sassanian (224-651 AD) and Islamic periods (from 651 AD onward). Tehran, however, only expanded during the Safavid period in the sixteenth century AD but became more important when Aqa Mohammad Khan, the founder of the Qajar dynasty, chose the city as the capital of Iran in 1786 AD (Sicker 2001: 87). AS Ray was used as a recreation centre under the reign of the Qajar dynasty, Fath-Ali Shah often used to explore the city. In 1831 his portrait and that of some Qajar princes were engraved on a rock at Cheshmeh Ali hill and its surround decorated with tablets of poetry (Iran Chamber Society 2009). Since the Qajar dynasty, Tehran has became more developed and this expansion threatens not only the plain's natural environment but will result in the complete destruction of its archaeological record unless they are protected.

Cheshmeh Ali has been a focus of archaeological interest due to its visibility and relative proximity to Tehran. It was first excavated in 1912 by De Morgan, the director of the French archaeological mission at Susa, and again in 1924 by Dayet, a French diplomat based in Tehran (Fazeli et al. 2004). Cheshmeh Ali was then excavated by Erich Schmidt between 1934 and 1936 as a joint project between the University Museum at the University of Pennsylvania and the Boston Museum of Fine Arts. He distinguished three cultural periods, two historic periods, Islamic and Parthian, and two major prehistoric levels, Chalcolithic and Neolithic (Schmidt 1935: 41-9, 1936: 79-87).

Unfortunately, Schmidt died in a plane crash in 1964 and his goal of publishing the results of his excavations at Cheshmeh Ali was never realised. However, the elegant black on red Chalcolithic pottery unearthed by Schmidt has remained a key marker on relative chronologies for the prehistory of Iran's Central Plateau (Dyson 1991). The prehistoric site of Cheshmeh Ali was badly damaged by the urban expansion of Tehran and in the 1980s, it became a landfill and much of it was bulldozed to make way for houses. Fazeli was instrumental in getting the area turned into a city park, so at least the high mound would be preserved. Many of the areas where Schmidt worked, however, are now destroyed, so it is not possible to re-examine in detail the excavations of the 1930s, other than through material now held in museum collections in Chicago, Philadelphia, and Tehran.

In 1997, excavation was reopened in the surviving portions of Cheshmeh Ali after a sixty-one year hiatus through a collaborative effort by the Cultural Heritage Organisation of Iran, the Department of Archaeology of the University of Tehran and the Department of Archaeological Sciences of the University of Bradford. The chronology of the Tehran plain and the dating of the "Cheshmeh Ali" style had been based entirely on a series of relative ceramic chronologies, thus one of the main aims of the excavation was to generate an absolute chronology for Cheshmeh Ali. It is also clear that the date ranges and nomenclature of relative chronologies for this region differed substantially from one another.

Fieldwork at Cheshmeh Ali began by removing piles of accumulated domestic waste, then two trenches were excavated, Trenches E4-5 in the west and H7 in the east side of the site in 5 by 2 metres, reaching a depth of 11 metres and showing stratigraphic sequences that exhibit a pattern of change through time without any major disruption from the Late Neolithic to the Early Chalcolithic period (Fazeli 2001: 74-76, 2004). While thousands of ceramic sherds have been collected, only about 100 stone tools were recovered, which is rather surprising, considering the relatively early periods of occupation. In fact, only 427 stone tools have been collected in the Tehran plain survey that identified twelve prehistoric settlements ranging from Late Neolithic (6200-5500BC) to Late Chalcolithic (3500-3000BC) period (Fazeli 2001). In trench E4-5 some architectural remains were distinguished belonging to the former period. This consisted of a small mud-brick wall built on a fine sand foundation. According to the authors, although the data was too scanty to examine the architectural units of this period, it indicates that during the Late Neolithic period mud-brick was utilised for construction. In the Transitional Chalcolithic levels, many architectural units were identified, including ovens and burial remains (Fazeli 2001: 76). A total of 10 radiocarbon samples were selected for dating purposes from the excavations, one from trench E4-5 and 9 from H7 and the upper and lower parts of the sequence did not yield suitable material for AMS dating. The results of the radiocarbon determinations taken from Tepe Cheshmeh Ali are presented in Table 3.2.

3.3.3 Tepe Zagheh

The site of Zagheh is a low mound covering about 1.5 hectares. It is located about 60 kilometres southwest of the modern town of Qazvin. Zagheh measures about 350 metres long and 200 metres across (Negahban 1979). Excavation at the site was begun in 1970 by Negahban and group from Department of Archaeology of University of Tehran. Malek Shahmirzadi was in charge of the excavations at Zagheh in 1972 and 1973. Negahban made additional excavations in 1974 and 76 and Malek Shahmirzadi (1979) in 1977. Over 1350 square metres were exposed horizontally but only one deep sounding trench F.G.X. was excavated (Malek Shahmirzadi 1980: 14). In 1973 season, a 3 by 3 metres area in squares G.X and F.X was excavated; this trench was an extension of a test trench F.X., measuring 1 by 1 metre, from the 1970 season. The deep trench F.G.X., virgin soil was reached at 6.1 metres from the surface. During the 1973 season, one of the principle goals was to expose as much as possible of the latest settlement at Zagheh. By the end of the season, 1050 square metres of level II, the uppermost well-preserved stratum, had been cleared and sixteen domestic architectural units had been identified in squares C.IX to XI, D.IX to XI, E.IX to XI and part of FX. The sixteen units have been assigned Roman numerals from north to south in each column (Malek Shahmirzadi 1977b: 84, 1979). It showed a continuous cultural sequence with no major disruption. The characteristics of the architectural remains reflected cultural continuity throughout the occupation with no major or significant interruptions. Twelve levels of occupation were exposed in an area of about 1.25 sq. metres. (Malek Shahmirzadi 1977b: 84).

The findings from the horizontal excavation at Zagheh included the discovery of a shrine with an interior decoration, a grave with local and imported goods, administrative artefacts such as tokens, and residential dwellings. These findings were described in considerable detail by Malek Shahmirzadi and Negahban (Malek Shahmirzadi 1977b, 1979, 1980 1988; Negahban 1979). The 16 Architectural units excavated in whole or in part vary in size and ground plan, but all shared certain techniques of construction and certain uses of space, which can be described as follows: The units are basically rectangular, from 3 by 3 to 7 by 13 metres, although the walls are usually not straight. The units are not free standing with large open spaces between them. Instead, they are built adjacent to one another, although at least one side must face a passage or open area to allow access to the unit, and one or more of the four enclosing walls of each unit is shared with an adjoining unit. In cases where adjacent units do not actually share an enclosing wall, the narrow space left vacant between them is used as a garbage dump - the best example of such a space is the area between the south-eastern enclosing wall of unit V and the north western enclosing wall of unit VIII. The long axis of each unit is either from northwest to southwest or northwest to southeast and the main entrance usually does not face northwest. This is understandable since, if we assume that wind patterns have not changed in the past 8000 years, such a door would have been exposed to the cold prevailing winds of “Mihr” (Malek Shahmirzadi 1977: 32-33, 1979). The walls are constructed from the most easily obtained material, mud, in the form of either “chineh” an Iranian variety of pisé, or sun-dried mud bricks. Stone is scarce in the vicinity of Zagheh and was used in only one location in unit XIV where it served as the foundation for small storage room. The mud bricks were made by hand without models, the clay was tempered with chaff, grass or small sand particles. All are long and narrow, usually 60 by 25 by 12 centimetres, while, the Largest are 87 by 27 by 12 centimetres, at both ends there are depressions made by pressing the four fingers of the hand a few centimetres into the brick. The painted building is a large, roughly rectangular structure with inner and outer buttresses supporting the walls, and doorways in the walls lead into a large U-shaped or horseshoe-shaped room surrounding a small annex room located in the middle of the southern wall. This large U-shaped meeting room contains a number of terraces or benches built around walls, which had been painted and decorated with animal skulls and horns. There are two entrance doorways into the painted building, the walls of this large meeting room were painted and decorated in a most interesting fashion, first the surface of sun dried brick and pisé had been smoothed, then levelled with a coat of well levigated clay mixed with small pieces of straw, and on top of this smooth base a coat of red ochre, nearly 1 millimetres thick was applied (Negahban 1979).

At Zagheh, a prehistoric agricultural community with some traces of industrial activity, a number of burials illustrate some of the earliest funerary practices (Malek Shahmirzadi 1988: 10-12). In the graves which are located within the village, infants under three years old were buried under the floor of roofed enclosures, which may have been used for either living or storage. Sometimes very small infants were placed in holes dug into the walls and no burial objects were found with the skeletons. While, adults over fifteen years old were buried in open areas, like courtyards or even entirely outside the living quarters, in alleys or other open sites, and the bodies which were coated with a red ochre were not positioned in any special way. These remains were accompanied by simple ornaments, tools, and small pottery vessels, and many graves were topped by piles of elongated sun-dried bricks. A few instances of very low brick walls aligned in the same way as the bodies beneath are the earliest indications of tomb construction at the site. Two major phases are visible in the pottery sequence at Zagheh; the oldest levels, XI1 to IX, have yielded ‘Zagheh type pottery’, which consisted of plain, painted and ‘crusted’ ceramics, Levels VIII to I correspond to ‘Cheshmeh Ali’ type I (Sialk II) a key element in the relative chronology of the Iranian Plateau, and also found at a few sites at the edge of Dasht-i-Kavir, the central desert of Iran (Ghirshman 1938; Malek Shahmirzadi 1990), this site according to Majidzadeh’s chronology, falls within the archaic period of the Central Plateau culture (Majidzadeh 1976, 1981).

Zagheh is thus a critical site for understanding the dynamics of the Iranian plateau prehistory and was re-excavated by Fazeli of the University of Tehran in 2001. The main objectives of his new work were to ascertain the settlement size of the site, demonstrate the craft areas of the site, collect radiocarbon samples to establish an absolute chronology and re-examine the pottery sequence in relation to the dating of the site. Five out of the eight trenches that were opened reached virgin soil, exposing a total of 18 square metres at the basal levels. Details of the five deep trenches is presented in Table 3.1.

Trench A is located about 50 metres northwest of the deep trench T.T.F.G.X. which was excavated by Malek Shahmirzadi in the 1970s. It contains one burial in the uppermost layer (context 1) together with two bone needles. Architectural features such as walls and floors as well as ovens were found in subsequent levels. Several pits were located in contexts 26-32. Bones, stone tools and pottery sherds were found in all layers except two of the pits (contexts 27 and 31). Copper tools and spindle whorls have been found in context 11. Trenches C3, D and E contain walls, floors, oven, bones, stone tools and burials suggesting that they may represent domestic areas. There is, however, a general lack of these domestic features in trench K (located at the southern edge of the mound) where no ovens, walls, floors or burials have been found. In contrast, this trench contains the highest number of pottery sherds, accounting for 31.8% of the total sherds which were recovered, and remains of kilns were found in contexts 3, 4 and 18. In contexts 8 and 9, fragments of finished, unfinished and deformed figurines were recovered together with spindle whorls and raw materials (clay lumps) for pottery making. Pigment was found inside a bowl suggesting that it may have been material used for painting pottery. These artefacts are similar to those found by Malek Shahmirzadi in the ‘workshop area’ (Malek Shahmirzadi 1977a: 358-376). In addition, large stone bowls with pounding marks on their interior walls were also uncovered. The exact function of these bowls is not known. Cores showing signs of being heated have been found, suggesting that lithic tool production may also have taken place here. Together with the general lack of domestic and residential features, the evidence of ceramic and lithic production suggests that the trench is likely to be located in an area of craft production. The stratigraphic evidence from the latest excavation at Zagheh shows continuous occupation with no disruption. There are too few structures in the excavated trenches to make any architectural inference. The strata were distinguished by changes in soil colour, texture and composition. Individual layers in Trench K were particularly difficult to distinguish, as the soil layers were soft and colours between the adjacent layers indistinct. This is probably due to the high percentage of ash in the composition of the layers. The depths of the archaeological layers vary from 4 to 6.3 metres from surface. Trenches A, D and E, which reached virgin soil at between 4.5 to 5.25 metres, are within 50 metres from the deep trench F.G.X., excavated in the 1970s.

The ceramics recovered from the re-excavation of Zagheh have been classified by the excavator, Fazeli into four main types: 1. Simple (undecorated) Zagheh type, 2.Painted Zagheh type, 3.Crusted type and 4. Cheshmeh Ali type (Sialk II ware).The first three types correspond to Zagheh type described by Malek Shahmirzadi, who considered them to be subgroups of a single type rather than separate types (1977b: 284-8). The importance of the new findings lies in the distribution of Cheshmeh Ali type rather than differences in types. For the purpose of statistical analysis, the first three types have been treated as "Zagheh types" as a single group. Cheshmeh Ali type is comparatively low in percentage and their occurrence is irregular across the layers of each of the trenches and from trench to trench. For example, although Trench D is only 10 metres from Trench E, there is a significant difference in the number of Cheshmeh Ali sherds being recovered. This probably accounts for the non-recovery of Cheshmeh Ali type in the lower layers of the small deep trench in the 1970s excavation. The contemporaneity of Cheshmeh Ali type and Zagheh type has important implications. Majidzadeh (1981) attributed the lower levels of Zagheh to the Archaic Plateau (Neolithic) period and the upper levels to Early Plateau (Transitional Chalcolithic) period, based on the occurrence of Cheshmeh Ali type. The new ceramic evidence suggests that the site may have been a Transitional Chalcolithic period site with the co-existence of Cheshmeh Ali and Zagheh types at all levels. In fact, there is little change in the technological production of the ceramics and forms from the lower levels to the upper levels in all ceramic types. While parallels exist between Cheshmeh Ali type ceramics at Zagheh and those from Transitional Chalcolithic levels at the re-excavation of Cheshmeh Ali 1997, there is no ceramic at Zagheh that corresponds to the Late Neolithic ceramics found at

Cheshmeh Ali. On both productional and typological bases, it can be concluded that Zagheh was a Transitional Chalcolithic site with no Late Neolithic material. Voigt and Dyson (1992: 166) have noted that there are “significant changes” with “more complex painted designs” in the later Painted Zagheh ware. This is to be expected as the settlement of Zagheh spanned nearly a thousand years, and it can also be attributed to the more extensive exposure of the site in the upper levels in the 1970s excavation (Fazeli et al. 2005). No stratigraphic drawing or sequence has been published.

Two samples of burnt wood were taken from the test trench in 1970 for radiocarbon analyses. They were collected at a depth of 2.89 metres from the surface, which have resulted in a dating of 5197 B.C. (Table 3.3). Further radiocarbon determinations on biological samples recovered from Tepe Zagheh were undertaken by Mashkour et al. (Table 3.4). Moreover, the researchers have conceded that direct comparison remains difficult since these dates were not adjusted for biological fractionation (Mashkour et al. 1999: 68). Four C14 dates have been obtained from mammalian bone samples. While, it was claimed that the period represented by these new dates range from 5212 to 4918 BC for Zagheh (ibid.), the comparison of this dating with previous studies from the 1970s (Bovington & Masoumi 1972) remains difficult since these dates were not adjusted for biological fractionation.

During the 2001 excavations, a further ten radiocarbon samples were taken from Trench A but they show discrepancies, particularly, samples ZH01, ZH06, ZH09 and/or ZH10. If ZH10 is discounted for the time being, both ZH01 and ZH09 appeared to be older than expected readings, while ZH06 has a more problematic dating, indicating that the sample is younger than the expected determination. The context from which ZH01 was taken was only 2 centimetres below the ground surface and was associated with a burial. Therefore, it may have been disturbed or contaminated by surface minerals, which can result in fallaciously high radiocarbon age (Renfrew & Bahn 1996: 136). ZH09 was taken from an unsealed ash pit and ‘old wood’ phenomenon may account for the apparent old date as well as possible disturbance and contamination during the formation of the pit, for example, material from a lower layer may have been mixed in during the fill. On the other hand, if ZH09 is considered as an accurate reflection of the context layer from which it was taken, then the result of ZH10, as that of ZH06, appears to be younger than expected. The problem may be a result of bioturbation, contamination by modern roots or earth, inappropriate handling, such as contact with paper products or fibres, laboratory error in preparation or analysis, error in stratigraphic interpretation and intrusion from upper layer(s) (Aitken 1990: 86-7; Bowman 1990: 27-8). One of the questions to be addressed in the re-excavation of Zagheh was the time span of the settlement. The discrepancies of the radiocarbon estimation necessarily mean that a conservative estimate has to be made, namely, the result of sample ZH01 has to be disregarded for the estimation of the abandonment of the settlement, since it is likely to be a contaminated sample. Likewise, the younger date of ZH10 should be accepted in favour of the older date of ZH09 since the degree of security of the deposit in an unsealed pit is open to question. The discrepancy of the result of ZH06 remains unresolved although a number of factors, as outlined above, may have been responsible. However, it does not unduly affect the estimation of the time span of the site's occupation. On the radiocarbon dating evidence, Zagheh was settled around 5370-5070 BC and abandoned around 4460-4240 BC (Wong 2008). The results of the radiocarbon determinations taken from Tepe Zagheh is presented in (Table 3.5).

3.3.4 Tepe Pardis

Tepe Pardis is located in the Tehran plain, close to Varamin, and comprises a mound of some seven metres in height above the surrounding ground level and covering an area of 4,200 square metres (Figure 3.4). Tepe Pardis was the most important site recorded during the 2003 survey of the Tehran plain, carried out as a joint project between the University of Bradford, University of Tehran and the Cultural Heritage Organisation of Iran (CHOI). It was initially identified as a Chalcolithic site by Mr Nase Pazuki of the ICHTO (Coningham et al. 2004, 2006; Fazeli et al. 2004, 2007a).

Three seasons of excavations at Tepe Pardis were undertaken in 2004, 2006 and 2007. In the 2004 season, two stepped trenches were excavated and in 2006 and 2007 seasons (Figure 3.5) two horizontal trenches and one deep trench were excavated (Figure 3.6). The Ceramics collected during these excavations stretched from the Late Neolithic to the Late Chalcolithic (c. 5300 - 3000 BC). Most of the ceramics recovered belonged to the Transitional Chalcolithic period with only a few Middle and Late Chalcolithic examples and the ceramics found in the lowermost layers in the stratigraphic test trench, VII and stepped trench II dated to the Late Neolithic period (Coningham et al. 2004; Fazeli et al. 2007a). As part of this study, 8 ceramic samples dating from the Late Neolithic from trench VII and 8 samples from the Transitional period from trench II.

During the 2004 season, two stepped trenches were excavated. Trench I was 2 metres wide and ran horizontally for 5 metres from the summit of the mound down to the modern land surface and trench II, also 2 metres wide, ran 5 metres horizontally from the edge of the modern land surface and the edge of the quarry face surface down to the natural soil 3.5 metres below. As the two trenches were linked together by a 2 metres extension, collectively they measured 10 metres long, 2 metres wide and had a maximum sequence of 10.5 metres depth (Coningham et al. 2006). During 2007 season, a Trench was opened on the south side of the mound in order to sample the archaeological sequence of the tepe in that location. Measuring 2 by 1 metres, it was designed to evaluate the vertical sequence of the site rather than to encounter structural remains. The first 2 metres of the trench contained mixed modern rubbish and archaeological materials washed down and collapsed from the Tepe but in situ remains were exposed below. With a total depth of 7 metres, the trench contained evidence of the Transitional Chalcolithic occupation and 1 metre of the Late Neolithic deposits at its base. Most importantly, the presence of collapse material associated with kiln structures, suggests that the Transitional Chalcolithic settlement at Tepe Pardis was a settlement focussed on ceramic production (Fazeli et al. 2007a). In order to define the chronology of the site various carbon containing objects found in the Pardis were subjected to the radiocarbon analysis. The analysis results are presented in Table 3.6 (Pollard et al. 2015).

Trench III was laid out to the east of trench I and measured 8 by 8 metre, Trench IV that was laid out to the west of trench I also initially measured 8 by 8 metre, however, it was later extended a further 5 metres to the west in order to expose more of the structures encountered there. During the 2007 season, a trench was opened on the south side of the mound in order to sample the archaeological sequence of the Tepe in that location. Measuring 2 by 1 metre, it was designed to evaluate the vertical sequence of the site rather than to encounter structural remains. The aims of the horizontal excavations at Tepe Pardis were focussed on fully exposing the mudbrick kiln excavated in Trench I. Two seasons of excavations have now confirmed its function as a large kiln and have also exposed the presence of a second large kiln to its immediate east. Together, they cover an area of 32 square metres and the presence of additional wall alignments to their north; east and south suggest that other structures were also present. The most complete kiln exposed in Trench III, kiln 2, was housed in a rectangular mudbrick structure measuring some 4 metres east-west by 3 metres north to south (Figure 3.7). Protected by a wall surviving to a height of 0.6 metres, its interior walls and floor were plastered and its roof supported by two free-standing plastered mudbrick pillars of 0.8 by 0.5 metres. Its floor was scattered with large broken sherds, ash and degraded mudbrick. Its western side was preserved to greater height on account of its proximity to the tell site contained two compartments, each of which measured 1.4 metres east-west and 0.6 metres north-south. Separated from one another by a low moulded wall, the remains of other moulded compartments was visible in the eastern side of the kiln although less well preserved. Kiln 1’s western wall also formed the eastern wall of the kiln exposed in Trench I (kiln 1). It is possible that the continuation kiln 2’s western and eastern walls formed a courtyard to the north of the kiln; the area between these walls had substantial deposits of ash and large broken sherds. The two seasons of excavation in Trench IV revealed a complex of walls and kilns that were recorded as 90 contexts. Its upper levels contained a mixture of modern waste, and Iron Age and Chalcolithic ceramics, but below their 62 centimetres extent, exposed “in-situ” deposits. Most features related to Trench IV’s three kilns confirm the presence of substantial activity during the Transitional Chalcolithic occupation of the site. Disturbed features included a number of badly truncated walls as well as a partial burial which had been very badly damaged by quarry machinery. Chronologically, all well preserved contexts exposed in the 2006 and 2007 seasons of excavations are directly related to the Transitional Chalcolithic period (Fazeli et al. 2007a). These are sealed below a shallow deposit of disturbed material with a mixture of Middle, Early and Transitional Chalcolithic ceramics.

Three seasons of excavations at Tepe Pardis exposed over 60 square metres of mudbrick structures dating to the Transitional Chalcolithic, including five kilns. The presence of these kilns, in association with a terracotta slow wheel, as well as, the presence of kiln debris on the southern side of the mound, suggested that the industrial zone encapsulated much of the ground. The importance of Tepe Pardis was confirmed by a badly damaged Iron Age cemetery to the north of the main site.

3.3.5 Tepe Ozbaki

Ozbaki is a large site situated at a plain at the foot of the Alburz Mountains, 75 kilometres northwest of Tehran and covers around 100 ha. It is dominated by a high tepe 26 metres above the level of the plain, while the presence of many small and low tepes have also been registered and on some of them soundings and excavations have been made. The site has extensively been excavated by Majidzadeh (2001: 141-5; 2010a, b). The most prominent excavated trench, Trench 1, a step trench, 34 metres high showed that Ozbaki was settled for the first time in the 7th millennium BC and had been occupied until the Islamic period. Five levels of occupation have left architectural remains belonging to two distinct cultural periods with an estimated dating between the seventh and sixth millennium BC. The major tepe (site A) is surrounded by nine (B-J) smaller sites and an average height of 5 metres. Five of them (B-D, I-J) have been excavated. During three seasons of excavation between 1998 and 2000, various surveys have illustrated the importance of the site, including the oldest layers that date back to the seventh millennium, and the most recent Mede and Islamic eras. The oldest remains found so far are located on site Yan Tepe, which is located 700 metres southwest of Tepe Ozbaki. Preliminary findings from Trench I at Yan Tepe showed ceramic wares similar to Sialk I and II and resembling to those from Qara Tepe of Shahriyar. Towards the middle of the period corresponding to that of Sialk II and for reasons still unknown inhabitants of Tepe Yan abandoned their property and moved 200 to 300 metres to the west and northwest. Sherds of the Cheshmeh Ali ceramic type are present throughout the site: they were also found 100 metres east of the large mound (site A) as well as, in sites C, D, J, that is to say, about 30 hectares (400 by 800 metres) which seems huge compared to the sites known to date, containing the remains of these old periods. In the next period, further west, work was focused on site A (large tepe) and showed that the ceramic " Cheshmeh Ali" succeeded "plum ware", fragments of which were also found on site C. This pottery does not appear in local production. Its decoration and its manufacture are completely different from that of the Central Plateau of Iran. On the mound Ozbaki, this pottery is present above the virgin soil in the first layers. It is followed by the pottery known as "Sialk III". After these brief reviews of the Ozbaki, we will focus on the earliest periods that Majidzadeh examined “yard by yard”. The layers of the seventh and sixth millennia helped to appreciate the architecture of these old periods. The average surface parts are between 2.5 by 3.5 metres, but some are slightly larger. These spaces which are very small should had been covered by rudimentary branches combined with a little mud. Under the floors paved with mud bricks and at each level, there were graves; indicating that the dead are buried under the floors of rooms. A monumental building was also unearthed, whose architecture is more elaborate than the ordinary buildings of that period. The remains indicate that this building consisted of three levels separated by 60 centimetres. Although it is impossible to establish the dimensions of this building, it appeared that the area of each level was smaller than the next level above it. The highest level was levelled such that only two steps needed to access it. The floor had been preserved through a circular cement base, and the lowest level, the basement is located in a position to be aligned with the centre of the middle floor. This building is too small to assume a religious character for it. All its walls are covered with a coating (Kahgel) ochre, which seems to be created in a later reconstruction operation. The floor is covered with a red coloured cement type product. A rectangular platform (approximately 2 by 0.75 by 0.15 metres) also coated with ochre Kahgel was the place where the offerings were filed. Ceramics associated with this building seems to be the same age as "Early Plateau B", contemporary Sialk II. This allows an estimate of the construction date to the late seventh, early sixth millennia BC. A yard (10 by 10 metres) was also opened during the excavations of the third season. In the lower layers were identified some houses that their walls were covered with ochre Kahgel and seems to be the same age as the building, previously described as period of "Early Plateau B" (Contemporary Sialk II) and three graves were also excavated. The remains of the upper levels of the village were almost destroyed by the cemetery. Excavations in the region of Tepe Ozbaki are prominent because they bring many new elements to the prehistoric cultures of the Central Plateau. Ceramic and architectural remains from the 34 metres step trench in the main mound suggest an occupation period extending from the fifth to the first millennium BC (Majidzadeh 2001; 2010a, b).

3.3.6 The Tepe Chahar Boneh

Chahar Boneh was identified during the settlement survey undertaken in 2003 (Fazeli et al. 2004) and excavated in the summer of 2006 over two months. Located at 1279 metres above sea level, it lies 3.3 kilometres to the southeast of Zagheh, and 4.2 kilometres southeast of Ghabristan. Lying within a shallow depression, it covers an area of 2000 square metres – or 4000 square metres including surrounding scatters - and is encroached by agriculture. There are low ridges at the edge of the depression, which may represent structural remains. Painted Buff and Red Ware sherds were visible upon the surface, along with chipped stone tools including blades, debitage and cores. With the potential for earlier occupation sequences, eight 2 by 2 metres trenches were excavated during 2006 in different parts of the site. However, despite two months of excavations few architectural remains or coherent contexts were identified. Instead, the excavators found a series of cultural contexts, which were interspersed with natural accumulations. In terms of artefacts, only pottery, lithics and animal bone were recovered.

The stratigraphy outline of the three excavated trenches was as follows: Trench I was located to the west of the site, on a shallow slope. Initially a 5 by 5 metres area was opened, and topsoil removed. Subsequently, a smaller

2 by 2 metres trench was excavated to a depth of 4.41 metres with a total of 14 contexts – eight cultural contexts, five natural contexts, and the topsoil. The natural context, interspersed within the cultural strata, were composed of gravels and fine sand suggesting that the site underwent periodic sedimentation from riverine water. However, no architectural remains were identified and only ceramics, bone and lithics were recovered (Fazeli et al. 2007b). Trench II was located 20 metres away in the northwestern corner of the site, and measured 2 by 2 metres and reached natural soil at a depth of 5.1 metres. A total of 24 contexts were recorded with ten cultural context again interspersed with contexts of gravel and sand. However, there was a greater density of artefacts recovered from Trench II, including pottery wasters and traces of burnt soil and ash. Trench III was located in the eastern corner of the site, 15 metres from Trench II, measured 2 by 2 and reached natural soil at a depth of 3.55 metres. A total of 18 contexts were excavated with pottery, bone and lithics recovered. Again, no architectural remains were identified and all of the artefacts were recovered from the upper eight contexts, two metres below the surface. Due to the scarce nature of finds and absence of architectural features, a further trench – Trench VI – was opened 10m away, and contained fourteen contexts, including ten cultural contexts within the 2.81 metres depth (Fazeli et al. 2010). One context in particular, context 608, was a hearth surrounded by burnt clay and covered in ash. The context was relatively compacted and composed entirely of fired clay and brick. Additionally, context 602 was comprised of 80% burnt soil with a large amount of burnt animal bone. However, again there was little in the way of architectural remains or artefacts other than ceramics, lithics and bones. As such, this led to the preliminary suggestion that Chahar Boneh was a short-lived, seasonally occupied settlement site. The ceramics of Chahar Boneh can be divided into two groups – simple buff and painted buff wares. However, due to a lack of control within the firing process, some sherds are light greenish-grey on the exterior and, in other cases, the surface colour is not consistent. Within the lower layers, there are grey ware sherds - again, a result of poorly controlled firing - and sherds with smoky surfaces, indicating the use of open kilns. Due to lack of control over the firing process, the vessels are sometimes fired green or completely turned into porous, anomalous wasters. Motifs generally

include geometric designs, with bands of triangles and lozenges; cross-hatchings; checkers with square, triangle or lozenge patterns; basket impressions; and steps are most common. The interior surface is sometimes decorated with scalloped motifs resembling waves. In most cases the interior surface is painted and often both exterior and interior surface is decorated.

In order to obtain important information concerning the chronology and cultural development of the site 15 charcoal samples from Chahar Boneh were subjected to the absolute radiocarbon analysis at Oxford University.Table 3.7 depicts the results of analysis (Fazeli et al. 2009, Pollard et al. 2012).

A total of 1,652 animal bones and bone fragments were collected during excavations at Chahar Boneh and, of these, 70 were identifiable to skeletal element and animal type or species. This means that only some 4% of the assemblage could be identified, which in turn makes it very difficult to offer even tentative suggestions about what this assemblage might represent in terms of human-animal relationships. This extremely low percentage for identification is a result of the very poor condition of the bone. The vast majority was extremely fragmented - pre-depositional fragmentation - and the bone was also badly degraded. Quite a high proportion of the assemblage, around 60%, also had thick layers of soil concretions, which made any attempt of identification impossible. According to the authors, while the identified bones cannot provide more than the most superficial qualitative analysis, nevertheless they do provide information which can be added to the growing body of data of animal bones from sites in the Qazvin Plain (Young & Fazeli 2008). Sheep and goat were the most numerous of the identified bones, accounting for more than half (59%) of all identified bone. However, when the numbers of cattle, equid, gazelle, pig and wild goat are combined, they account for more than one third (35%) of identified bone, which suggests that the occupants of Chahar Boneh were exploiting a range of different animal types for economic purposes. The majority of identified bones came from Trenches II and V. In contrast, no identified bones were recovered from either Trench IV or Trench VIII. Trenches V and VI contained most of the unidentified bone. Very little bone was recovered from Trenches IV and VIII, which might suggest that either these trenches were in areas not used for domestic activities, including waste disposal, or, given the overall bone preservation, might be connected to local soil conditions. The authors stated that (Young & Fazeli 2008) “the number of identified animal bones from Chahar Boneh is too small to make any analysis or interpretation with any degree of confidence, but this assemblage does add to our overall data for animal bones in the Qazvin Plain. The data from these sites can be added to the increasing growing body of animal bone data from sites in the Qazvin Plain. This means that we are developing a relatively comprehensive picture of human-animal relationships in this region diachronically, from sites such as Zagheh, Ghabristan and Ismailabad”. When this is added to extant published studies (Young & Fazeli 2008), we will be able to look at such things as long term trends, site function, and changes in function through the lens of animal bone analysis.

3.3.7 Tepe Ebrahimabad

Tepe Ebrahimabad is located in 20 kilometres southeast of the city of Qazvin, Standing at 1232 metres above sea level. It measured about 250 by 250 metres and is eight metres high (Figure 3.8). The most important point concerning the excavations at this site is that for the first time it provided evidence of the pottery characteristics of Sialk I in Qazvin plain. Initially, the distribution of Sialk I pottery has been recorded in Tehran plain through the excavations at Tepe Cheshmeh Ali (Fazeli et al. 2001), Tepe Pardis (Fazeli et al. 2006), Tepe Sadeghabadi, Tepe Arastu and other sites. The presence of Sialk I pottery, with its main distribution in regions such as Kashan and Tehran, shows that by early sixth millennium there were cultural interactions across vast portions of the Central Plateau. Thus, the first step was the excavation of Ebrahimabad in order to provide an absolute chronology for the Qazvin plain's Late Neolithic to Early Transitional Chalcolithic sequence (c. 5600-4600 B.C.). Following initial analysis, two main cultural levels were identified at the site, Late Neolithic and Transitional Chalcolithic, providing the absolute framework by concentrating on the sequence of nine dates from Trench II. As a result, on account of the ceramic and stratigraphic evidence, the ranges between c.5210 and 4997 B.C was defined for the Early

Transitional Chalcolithic and the date range for the Late Neolithic was estimated to be between c. 5566-5478 B.C. to c. 5320-5206 BC.

Although Tepe Ebrahimabad was identified during the 2003 survey, stratigraphy excavation at the site was only carried out by Fazeli of the University of Tehran in 2006. Three stratigraphic trenches were excavated, Trench I in the centre, II in the west-centre in 3 by 3 metres and III in the east side of the site in 2 by 2 metres (Figure 3.9). Trench I was opened after initially clearing 5 by 5 metres area of topsoil, and was excavated to a depth of 2.5 metres, after which it was stepped to 2 by 2 metres to a depth of 9.5 metres, and then 1 by 1 metres until virgin soil was reached some 11.25 metres from the top. A total of 70 contexts were recorded with four distinct architectural phases. The first architectural phase was evident within context 107, which comprised two curvilinear courses of mudbrick adjacent to a robber pit. However, the pit had cut the vast part of the feature. The second phase was represented by a series of scattered mudbricks within context 137 measuring 0.25 by 0.20 metres and 0.06 metres high, but in no discernable pattern. Similarly, the third architectural phase was represented by a scatter of mudbricks within context 141. The fourth and final phase was visible within contexts 144 to 147. Context 144 consisted of mudbricks within an ashy layer, context 145 was collapsed mudbrick, context 146 comprised three adjacent mudbricks, and context 147 was a layer of compacted clay containing mudbricks. 6476 ceramics were recovered from the trench, including 1641 sherds used to pave a floor surface in context 115 (Fazeli et al. 2007c). Eight main groups of Ceramics were found in Ebrahimabad: 1. Cheshmeh Ali (Sialk II) Ware, 2.Standard/Zagheh Crusted Ware, 3.Zagheh Painted Ware, 4.Sialk I Ware, 5.Simple Buff Ware, 6.Simple Red Ware, 7.Ebrahimabad Painted Ware and 8.Black on Red Painted Ware. The first four groups were found in the upper levels, whilst the Simple Buff and Simple Red Ware occur during both the Neolithic and Chalcolithic periods, whilst Ebrahimabad Painted Ware is present only during the Neolithic phase. Ebrahimabad Painted Ware and Black on Red Painted Ware ceramics were not previously reported within the Qazvin Plain (Fazeli et al. 2010). In Trench II, 78 contexts and one architectural phase were identified, which included collapse from mudbrick walls, floor surface, sun-dried mudbricks and pisé walls. The walls are, for the most part, constructed of handmade mud bricks with clay mortar, with some patches of pisé. The bricks vary greatly in size with no apparent attempt made at standardisation. The walls are 80 centimetres long, 30 centimetres wide, 43 centimetres high and 52 centimetres long, 30 centimetres wide and 40 centimetres high.

Studying the floral remains from the floor of this space yielded interesting results. Over the floor lay considerable amount of animal faeces especially from goats and sheep along with many cereal husks, alfalfa grains and a kind of fodder grain called small legume; these remains reflect the function of the space, which must have been used as an animal shed. This architectural phase is the point at which we took the carbon 14 samples, which have resulted in a dating of 5,320-5,206 B.C. From this trench, 2255 sherds have been recorded and eight main groups of ceramics were found in this trench. In Trench III, 65 contexts and three architectural phases were identified. Phase I comprised contexts 309, 311 and 317, a gravel layer, brick rubble and a small wall measuring 0.12 metres wide and 0.7 metres high. The second phase, contexts 342 and 345, consists of a wall and cluster of bricks, presumably collapse. However, the small trench size meant that it was not possible to distinguish any alignments. 1673 sherds, in seven main types were recorded; Black on Red Painted Ware was not identified in this trench. The excavated depth of the trench reached 7.24 metres, but the excavation was left incomplete (Fazeli et al. 2007c). The results of the radiocarbon determinations taken from Tepe Ebrahimabad are presented in Table 3.8.

3.3.8 Tepe Mafin Abad

Mafin Abad Tepe is located in Eslamshahr in south of Tehran west of Cheshmeh Ali. The site was occupied during the Transitional, Early, Middle and Late Chalcolithic periods (Fazeli et al. 2002, 2004). The site expanded to cover at least 5.5 hectares during the Middle Chalcolithic period and has more than 14 metres of archaeological deposits and the thickness of the Middle Chalcolithic layers is at least six metres. Such estimation has been made from a deep cut in the southeast of the site when more than one hectare of archaeological deposits were removed for use in a brick factory. Mafin Abad was excavated by Mr Chaichi in 2006.

3.3.9 Tepe Sadeghabadi

Sadeghabadi is a Late Neolithic and Chalcolithic site in the Tehran plain, some 17 kilometres from Cheshmeh Ali. The site is located on the southeastern slopes of the Arad Mountains between the villages of Mohammadabad and Ashtazon. The height of the site is five to six metres from ground surface. The size of the mound is roughly 90 by 90 metres and the nearest water source is the Karaj River, which is located nearly one kilometre from the site. The site was occupied during the Late Neolithic, Transitional, Early and Middle Chalcolithic periods (Fazeli et al. 2002, 2004). The existence of some Bronze Age, Iron Age, Islamic and modern settlements around the site indicates that this part of the plain has been occupied since prehistoric times. A small area northwest of the site was disturbed allowing the team to record Late Neolithic ceramics in the exposed section.

3.3.10 Other associated projects

Arisman, a site 60 kilometres southeast of Kashan, was investigated by a multi-disciplinary team of Iranian and German archaeologists, metallurgists, geologists and conservationists. Preliminary reports by Chegini et al. (2004) suggest an occupation period from late fifth millennium BC to possibly late second millennium BC. Materials recovered from the first season of work have been dated to Sialk III and IV periods. In addition, a survey of the Veshnoveh mines was undertaken, being the first systematic study of the mines since their discovery in the 1960s (Chegini et al. 2000: 311-5). Results from this project will certainly enhance knowledge of ancient mining and the stratigraphic excavation will help to refine the understanding of the cultural and technological development of the region.

Other excavations from these periods include Burton Brown’s study of Ghara Tepe in Shahriyar, (Burton-Brown 1962: 27-31), some forty kilometres southwest of Cheshmeh Ali, and Hakemi’s excavation at Ismailabad

(Moushelan Tepe) near Karaj in 1961(Voigt & Dyson 1992), some fifty kilometres west of Cheshmeh Ali. However, Ghara Tepe does not contribute much to our knowledge since the site was not excavated stratigraphically and as yet no report on Moushelan Tepe has been published (Majidzadeh 1978). Tureng Tepe in northeast Iran, near Gorgan, was excavated by Frederick R. Wulsin during two short field seasons in 1931 and Deshayes excavated at Tureng Tepe in 1960 and 1961 (wulsin, 1932; Deshayes 1963). The Prehistoric Archaeological Expedition of Tsukuba University worked in Iran between 1971 and 1977 for four seasons and team was led by Seiichi Masuda, who had worked on Egami's excavations in Merv Dasht and Deylaman. The goal of this mission was to compare the early stages of development in ancient farming villages of southern and northern Iran. His team focussed on two sites: Tepe Jari-A in southwest Iran and the eastern and western mounds at Tepe Sang-e-Chaḵamaq (Bastam, Semnan province). They excavated these sites in 1971, 1973, 1975, and the western mound again in 1977. At Sang-e Chaḵamaq, the western mound had five strata. As potsherds were only found in the third stratum, the introduction of pottery is dated to this period. Three types of buildings were excavated, the first of which contained rooms with a simple beaten earth floor and a hearth at floor level; apparently it was a workshop for everyday use. Another type had a room whose floor was covered with thick plaster painted in red, and this building is believed to have served for religious functions. Here, the hearth is on a raised base and so is considered to be some sort of fire altar. The third type of building formed a small room with a raised, plastered floor and is interpreted as a sacred place for offerings as the finds comprise a few clay figurines of mother goddesses and animals as well as bone spatulas, flint blades with microlithics, and obsidian blades with flint cores. The eastern mound, which is larger, had six strata. The pottery decoration consisted of geometric patterns in red-brown pigment. Painted pottery of the Jeitun type (Sialk I) was found in all strata, while pottery of the Cheshmeh Ali type (Sialk II, 6,500 B.C.E.) also was unearthed in the upper strata. Notable objects were a husking tray from the third stratum and a house-shaped model. Other finds included cosmetic implements of clay or stone, round spindle wheels, stone tools, and sickle shafts with animal decoration. A significant find was a small piece of copper tubing, which suggests that metalworking had already begun in this area during the prehistoric period. This mound reveals the early stage of an agricultural settlement of a pre-pottery culture, as well as a more advanced stage with painted pottery. The stratigraphy excavation was carried out in Tepe Chahar Boneh by Dr Fazeli of the University of Tehran in 2006 (Fazeli et al. 2010).

Despite more intense survey, there is still no evidence for an aceramic Neolithic within the three important regions of Qazvin, Tehran and Kashan Plains (Fazeli & Matthews 2013; Fazeli et al. 2014).

3.4 Conclusion

The results of the excavations of Tepe Hissar and Tepe Sialk have provided the major cultural sequences for the Central Plateau of Iran. The excavation of the key site of Cheshmeh Ali, which was undertaken at about the same time has never been fully published. In the 1970s, findings from the excavations of the Qazvin plain sites of Zagheh extended and partly replaced the sequence established at Sialk. The Revolution of 1979 and the ensuing Iran-Iraq War of 1980- 1988 put a halt on all excavations within Iran. Since 1990, archaeological activities have increased considerably and the re-excavations of Cheshmeh Ali in 1997 and Sialk in 2008 and 2009 provided a clear stratigraphic sequence for these key sites and clarified the issue of settlement continuity in the Late Neolithic and Transitional Chalcolithic periods. The change from the predominantly cultural historical approach to one that is supported by a functionalist model of social evolution is in line with recent regional trends in archaeological research.

The Central Plateau is a popular region in which to study the development of the prehistoric communities, which emerged during the sixth millennium BC onwards. It seems that the social organisation of simple self-sufficient and independent local communities of sixth millennium BC transformed into complex social systems during the Chalcolithic period. The herding of domestic cattle, goat and sheep (Mashkour et al. 1999), cultivation of barley and bread wheat using the irrigation system (Gillmore 2009), long distance trade (Fazeli & Abbasnegad 2005), complex ritual activities, social differentiation in mortuary practices, specialised craft area (Fazeli et al. 2007a), standardisation of craft production, mass production of ceramics by using wheel drawing, using of kilns for ceramic production all contributed to the rise of ranked societies within the communities of the Iranian Central Plateau between ca. 5300 to 4600 BC. However, we still have relatively little information concerning the origin and development of pre-Chalcolithic societies within the Central Plateau.

Archaeological investigations within the Qazvin Plain have been underway since the 1970s with a focus on trying to understand the origins of the Neolithic period through excavations at the three sites of Zagheh, Ghabristan and Sagzabad (Negahban 1977, 1979). After numerous archaeological investigations within the Qazvin plain, it is clear that there is no evidence for a Mesolithic period and also no information about the origins of the agriculture societies. Recent settlement survey and excavations at Cheshmeh Ali (Fazeli et al. 2004) and Tepe Pardis (Fazeli et al. 2007a) within the Tehran Plain also failed to find evidence of pre-pottery Neolithic and early phases of ceramic Neolithic. By using stratigraphy information and C14 results, it seems that the earliest occupation of the region should not to be earlier than ca.5500 BC. There still remains no evidence of an aceramic Neolithic period within the three important regions of Qazvin, Tehran and Kashan Plain.

The next chapter will introduce the methodology used for this study and will provide detailed information about data collection and analysis methods.

Table 3.1 Details of the five deep trenches at Zagheh excavation 2001 (After Fazeli et al. 2005)

Trench	Size at surface	Size at base	Depth from surface	No. of layers	No. of contexts
A	2 x 5 metres	2 x 2 metres	4.5 metres	31	47
C3	2 x 2 metres	2 x 1 metres	4 metres	19	25
D	2 x 2 metres	2 x 2 metres	5.25 metres	24	26
E	2 x 2 metres	2 x 2 metres	5 metres	25	30
K	2 x 2 metres	2 x 2 metres	6.3 metres	23	27

Table 3.2 Radiocarbon determinations from the 1997 excavations at Cheshmeh Ali (After Fazeli et al. 2004)

Trench	Calibrated date using stratigraphic information (95% confidence)	Calibrated date (95% confidence)	Lab No.	Context No.
H7	5260BC-5000BC	5260BC-4940BC	OXA-9996	56
H7	5210BC-4980BC	5260BC-4950BC	OxA-9995	55
H7	5150BC-4940BC	5290BC-4990BC	OxA-9994	50
H7	4910BC-4740BC	4850BC-4600BC	OxA-9957	33
H7	4950BC-4770BC	4950BC-4720BC	OxA-9956	32
H7	4810BC-4720BC	4790BC-4540BC	OxA-9955	16
H7	4785BC-4690BC	4850BC-4610BC	OxA-9954	15
H7	4795BC-4690BC	4950BC-4690BC	OxA-9937	15
H7	4770BC-4610BC	4850BC-4590BC	OxA-9905	14
E4 -5	NA	5210BC-4780BC	OxA-9855	50

Table 3.3 The results of the radiocarbon determinations taken from Tepe Zagheh (After Bovington and Masoumi 1972).

Sample No.	Year of Excavation	Trench, Square	Level, Depth (cm)	Age (BP)	Calibrated BC (2 sigma)	Analysed Sample
TUNC 10	1970	FX	L 1	4900±73	3940-3520	Charcoal
TUNC 12	1970	FX	289	7147±91	6220-5880	Charcoal

Table 3.4 Radiocarbon dates from Zagheh, Late Neolithic (After Mashkour et al. 1999)

Sample No.	Year of Excavation	Trench, Square	Level, Depth (cm)	Age (BP)	Calibrated BC (2 sigma)	Analysed Sample
Gif 10226	1973	TTFGX	325-335	6100±60	5230-4800	Cattle, mammal
Gif 10343	1994	A8/4	35	5930±70	5000-4610	Caprine
Gif 10344	1973	D IX	110-130	5885±75	4940-4540	Mammal
Gif 10345	1970	F IX	-	5900±55	4920-4610	Mammal, cattle

Table 3.5. Radiocarbon determinations from the excavation of Tehran A, Zagheh (Fazeli et al. 2005).

Sample No.	Lab No.	Depth (cm)	Context No.	Result (BP)	Calibrated. 95.4% probability. (BC)	Year of Excavation
ZH01	WK12854	2	1	6154+/-49	5260-4949	2001
ZH02	WK12855	44	7	5489+/-45	4460-4240	2001
ZH03	WK12856	50	11	5936+/-69	5000-4610	2001
ZH04	WK12857	95	16	6152+/-46	5260-4940	2001
ZH05	WK12858	111	17	6124+/-46	5260-4850	2001
ZH06	WK12859	140	35	5991+/-65	5050-4710	2001

ZH07	WK12860	170	38	6233+/-48	5310-5050	2001
ZH08	WK12861	255	45	6169+/-78	5310-4850	2001
ZH09	WK12862	305	45	6410+/-50	5480-5300	2001
ZH10	WK12863	460	47	6295+/-47	5370-5070	2001

Table 3.6 Relative chronology of Tepe Pardis based on its ceramic sequence (After Pollard et al. 2015).

Trench	Context	Analysed Sample	Sample No.	C14 Determination (BP)
I	4	Bone	OxA-14736	1967±31
I	8	Bone	OxA-14738	5020±35
I	5	Charcoal	OxA-14737	5156±37
I	10	Bone	OxA-14739	5894±37
I	12	Charcoal	OxA-14740	6004±38
I	14	Charcoal	OxA-14741	5928±35
I	18	Charcoal	OxA-14742	5978±38
II	1003	Charcoal	OxA-14743	5976±36
II	1008	Bone	OxA-14744	6000±38
II	1014	Charcoal	OxA-14745	6100±39
II	1015	Bone	OxA-14746	6226±37
II	1017	Bone	OxA-14747	6230±45
Quarry Irrigation channel	G1	Bone	OxA-14748	1018±29

Quarry Irrigation channel	NX	Bone	OxA-14749	6152±40
Quarry Irrigation channel	DX	Bone	OxA-14750	6153±38
IV	4089 4433	Charcoal	OxA-18590	5972 ±32
IV	4089 4433	Charcoal	OxA-18591	6059 ±33
IV	3079 3425	Charcoal	OxA-18592	6036 ±29
IV	3053 3321	Charcoal	OxA-18593	5983 ±29
IV	6004 6030	Bone	OxA-X-2256-541	3148 ±30
IV	6009 6042	Bone	OxA-18762	3292 ±29
IV	6009 6042	Bone	OxA-18763	3236 ±29
IV	6008 6043	Bone	OxA-18764	3185 ±30
IV	6001 6044	Bone	OxA-18765	3088 ±29
IV	6032 6239	Bone	OxA-18766	3105 ±29
IV	6040 6222	Bone	OxA-18767	3137 ±29
IV	6036 6298	Bone	OxA-18768	3106 ±29
IV	6017 6307	Bone	OxA-18769	3175 ±40
IV	6028 6289	Bone	OxA-18770	3077 ±34
IV	6027 6224	Bone	OxA-18771	3203 ±34
IV	6042 6328	Bone	OxA-1872	3155 ±32

IV	6037 6291	Bone	OxA- 19023	3208 ±28
IV	6041 6329	Bone	OxA- 19024	3108 ±27
IV	6037 6188	Bone	OxA- 19025	3284 ±29
IV	6018 6302	Bone	OxA- 19026	3116 ±27

Table 3.7 Chahar Boneh, Late Neolithic (LN) radiocarbon dates (Fazeli et al. 2009; Pollard et al. 2012)

Lab Number	Location	Context	Depth (cm)	Phase	Material	Date (Uncal BP)	Calibrated date with 95% probability (BC)
OxA-17739	Trench I	110	334	LNI	Charcoal	6858 ± 35	5812-5666
OxA-17740	Trench I	109	334	LNI	Charcoal	6919 ± 35	5882-5728
OxA-17741	Trench I	109	334	LNI	Charcoal	6909 ± 35	5878-5724
OxA-17742	Trench III	306	246	LNI	Charcoal	7123 ± 35	6062-5976
OxA-17743	Trench III	306	246	LNI	Charcoal	7035 ± 36	5998-5843
OxA-17744	Trench IV	403	403	LNI	Charcoal	6835 ± 37	5792-5642
OxA-17704	Trench V	508	64	LNII	Charcoal	6210 ± 35	
OxA-17745	Trench V	508	64	LNII	Charcoal	6345 ± 34	
OxA-17746	Trench V	508	64	LNII	Charcoal	6241 ± 34	
OxA-17747	Trench V	510	140	LNII	Charcoal	6267 ± 34	
OxA-17748	Trench V	510	140	LNII	Charcoal	6311 ± 36	

OxA-17749	Trench V	510	140	LNII	Charcoal	6308 ± 35	
OxA-17750	Trench V	512	191	LNII	Charcoal	6355 ± 35	
OxA-17751	Trench VI	606	102	LNII	Charcoal	6177 ± 36	
OxA-17752	Trench VII	702	82	LNII	Charcoal	6289 ± 37	

Table 3.8 Ebrahimabad Late Neolithic II radiocarbon dates (Fazeli et al. 2010)

Calibrated date with 95%probability BC)	Context No	Trench No	Depth (cm)	Lab number
5228-5032	341	III	323	OXA-17737
5230-5030	355	III	533	OXA-17738
5320-5206	214	II	304	OXA-17602
5320-5206	238	II	384	OXA-17604
5326-5212	239	II	413	OXA-17605
5378-5218	241	II	434	OXA-17606
5518-5372	244	II	486	OXA-17603
5566-5478	266	II	722	OXA-17607
5220-5011	325	III	257	OXA-17736

Figure 3.1 Aerial view of Sialk North and South from Google Earth.

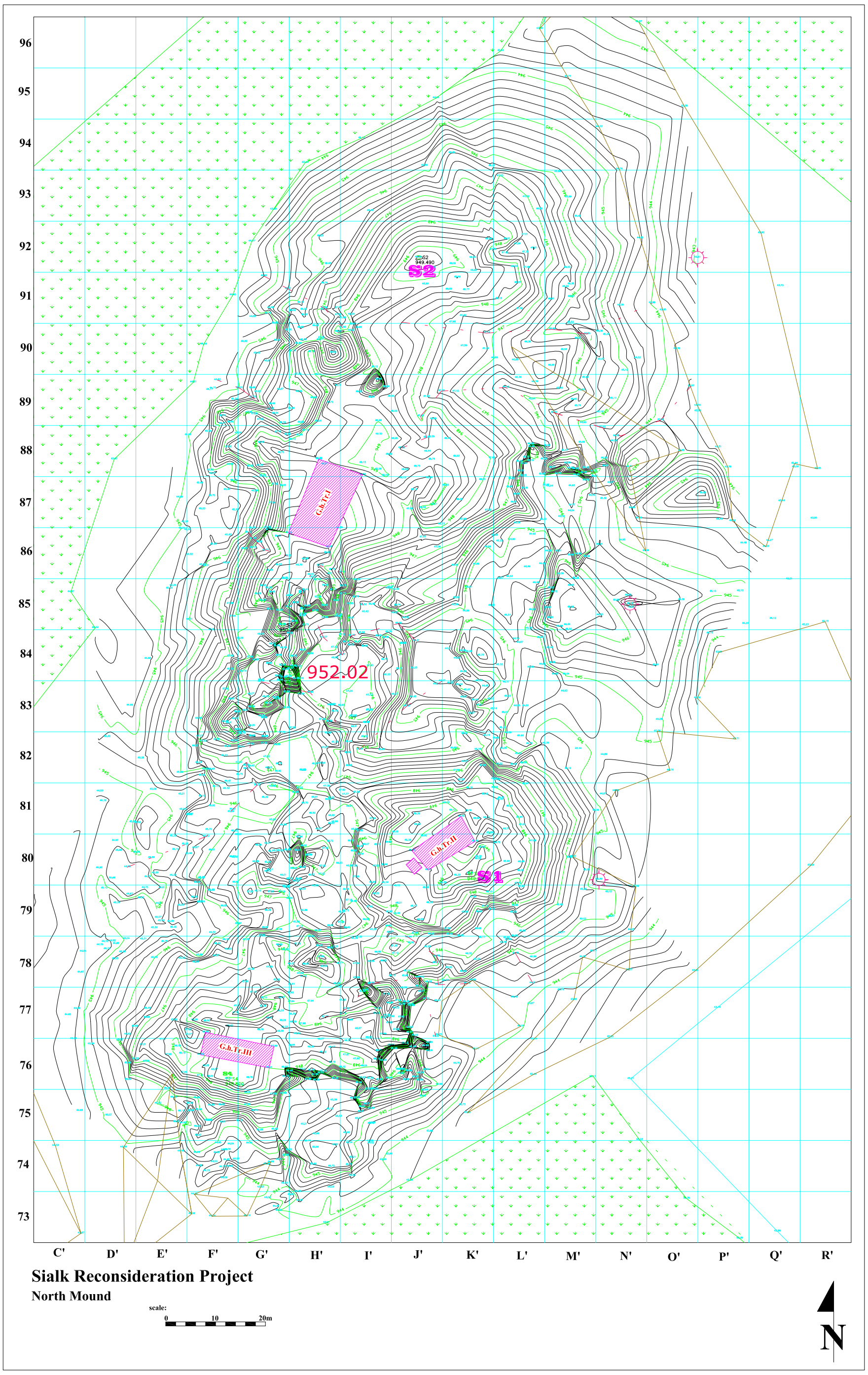


Figure 3.2 Contour map of the North Mound of Sialk showing the position of Ghirshman's Operations Number 1-3. (After Malek Shahmirzadi 2006b: map 3).

Figure 3.3 Cutting in Trench II, Sialk North (photo by Author 2009).

Figure 3.4 General view of Tepe Pardis (photo Coningham).

Figure 3.5 General view of the step trench down the northern face of Tepe Pardis. (Photo: Coningham).

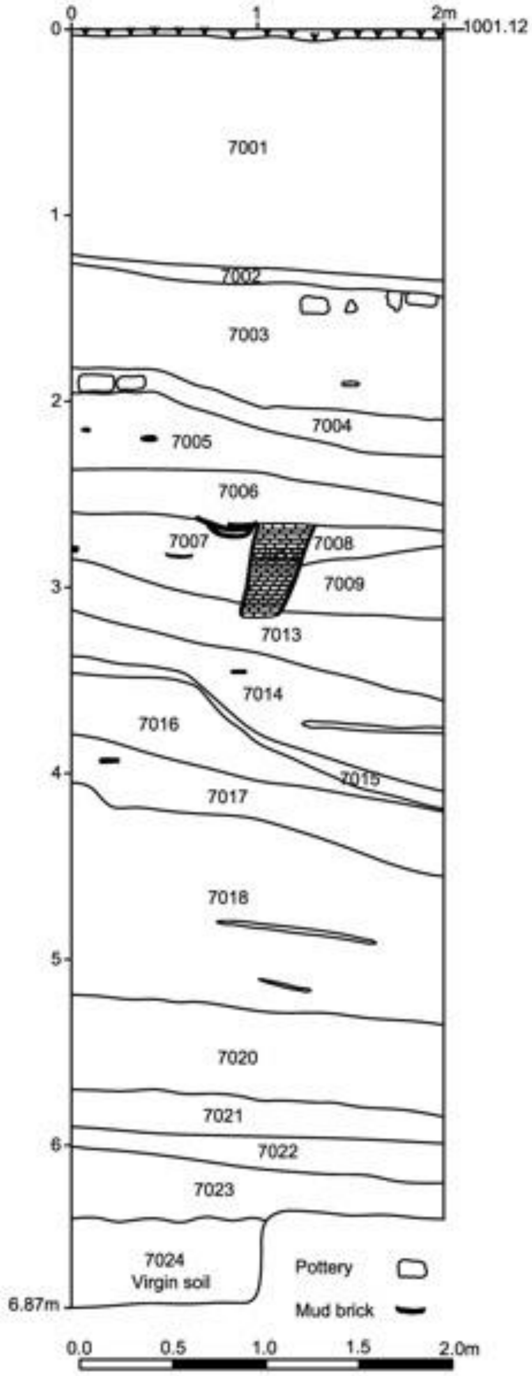


Figure 3.6 Tepe Pardis. Stratigraphy of test trench VII. Late Neolithic (layers 7023-7022), Transitional Chalcolithic (layers 7021 to 7004)

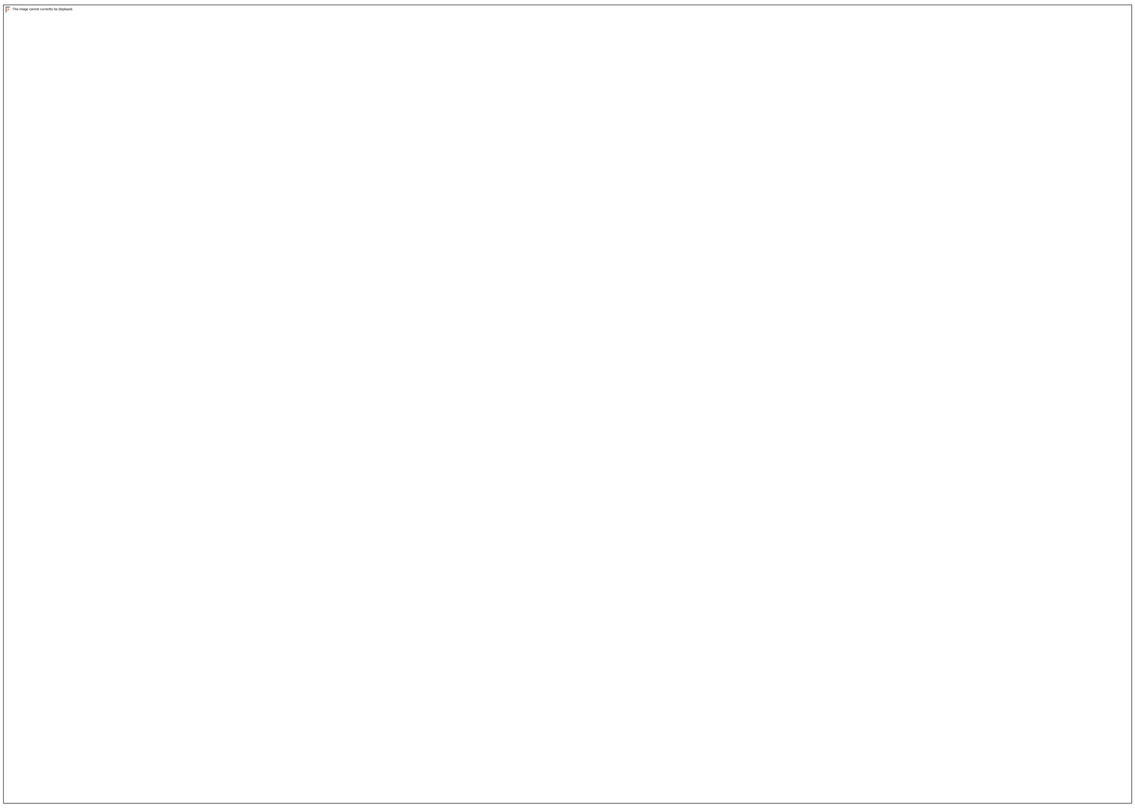


Figure 3.7 View of the mudbrick kilns in trench III. (After Coningham et al. 2006: Figure 12)

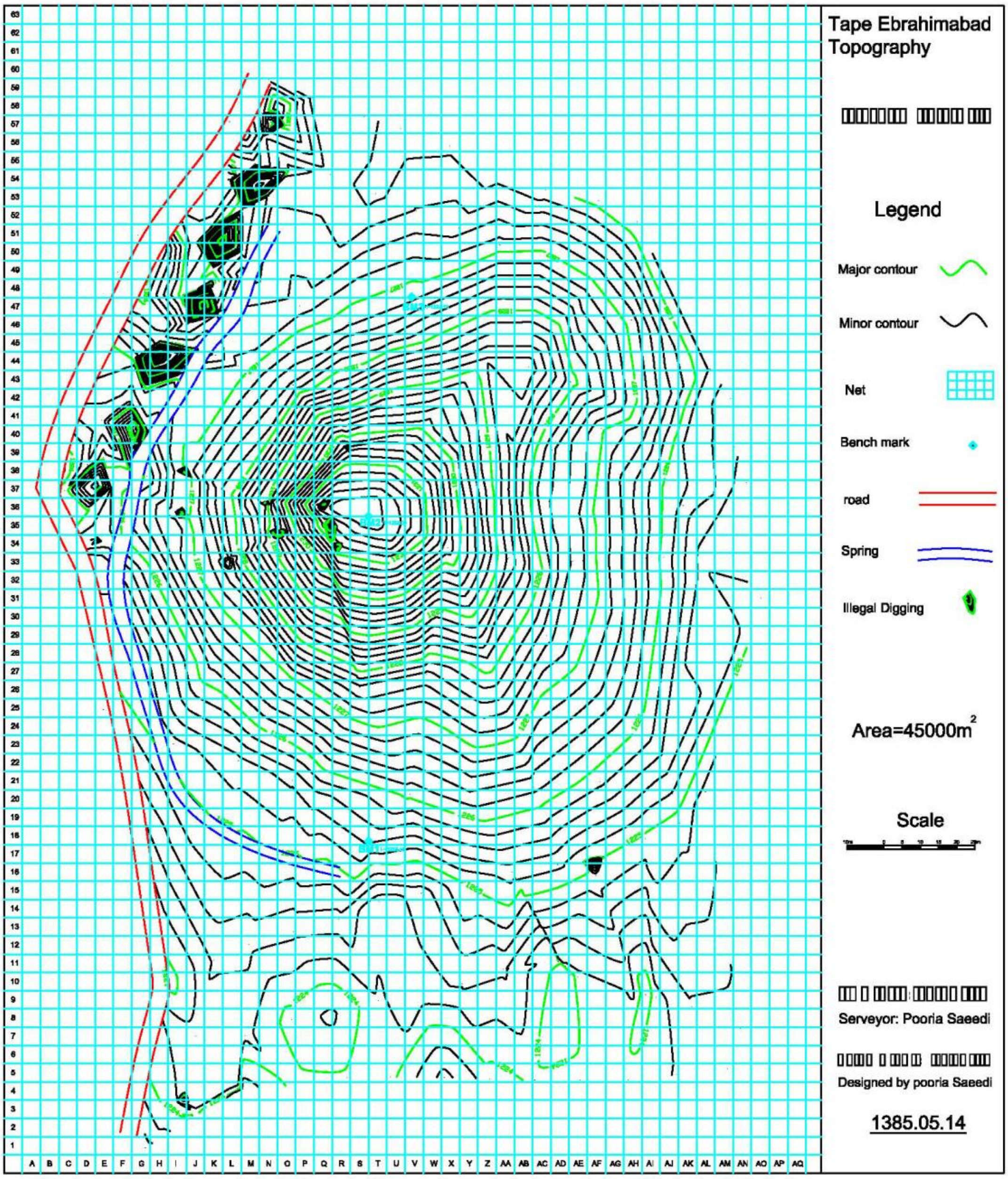


Figure 3.8 Topographic map of Ebrahimabad showing areas excavated by Fazeli. (After Fazeli et al. 2007c: Figure 2).

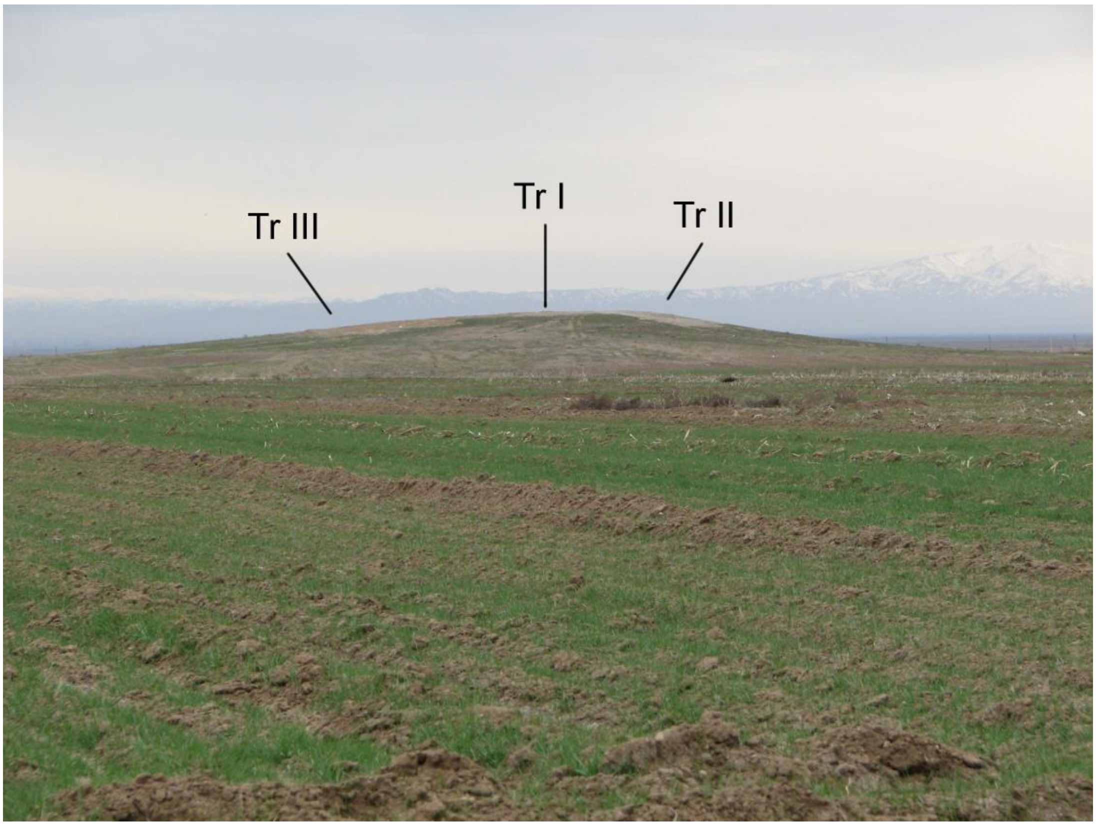


Figure 3.9 General view of Ebrahimabad showing the location of Trenches I-III. (After Fazeli et al. 2009: Figure 5).

Chapter 4: Methodology

4.1 Introduction

Chapter Three reviewed the archaeological background to this thesis and summarised previous research on the archaeology of the Late Neolithic through the Transitional Chalcolithic period in this region, thus fulfilling Objective Two of the thesis. Chapter Four will now define the methodology for the selection, presentation and characterisation of the samples obtained from the recent excavations at Sialk, Ebrahimabad and Pardis, assisting the fulfilment of the second, third and fourth objectives of the thesis.

This methodology has been designed on the premise that it will facilitate the study of pottery development from the Late Neolithic through to the Transitional Chalcolithic periods in the Central Plateau of Iran and will be achieved through the collection, analysis and interpretation of data on sherds selected from C14 dated sequences of the aforementioned sites.

Since the 1930s, many archaeologists have been engaged in the study of historical, cultural, technological and socio-political development of the Central Plateau and a number of chronological models have been proposed. The earlier studies of Ghirshman (1938), McCown (1942), Dyson (1965, 1987), Majidzadeh (1976) were largely culture-historical and focused predominantly on stylistic changes in ceramics. They relied almost exclusively on decoration, whilst shape and basic technology were largely ignored. For example, Ghirshman (1938) was one of the first archaeologists to conduct systematic archaeological investigations in the Central Iranian Plateau and was the first to excavate Sialk. Based on similarities of pottery design, he divided the site into four main phases: Sialk I (Late Neolithic), and Sialk II (Transitional Chalcolithic) located in the North Mound and Sialk III (Early, Middle and Late Chalcolithic) along with Sialk IV in the South Mound (Ghirshman 1938: 20). The North Mound, containing the earlier cultural deposits of the Late Neolithic period, was divided chronologically into two main phases, Sialk I and Sialk II. Sialk I, the Late Neolithic period (ca. 6000-

5200 BC), mostly contained pottery possessing a coarse buff body with black painted decoration whilst Sialk II (ca. 5200-4600 BC, Transitional Chalcolithic) comprised red pottery, painted in black. (ibid : 24, 27) based again on similarities of pottery design, proposed five sub-phases for Sialk I (I1-I5) and three for Sialk II (II1-II3). Despite its possible shortcomings, the periodisation and the chronological differentiation of pottery based on colour and decoration established at Sialk has strongly influenced the work of subsequent researchers. It continues to be used by them as the key cultural and chronological markers for the interpretation of the late prehistoric chronology of the Central Plateau of Iran.

For example, Negahban (1996: 350) used the same criterion of colour and decoration in dividing the prehistoric chronology of Iran into eight stages. Similarly, Majidzadeh (1981) used it and its underpinning the cultural-historical approach to propose a model to explain changes in society and settlement history in the Central Plateau. He suggested that the distinct changes which occurred at certain sites of the Early and Middle periods of the prehistory of central Plateau were the direct impact of outside people who produced two “types of pottery”, the “Plum Ware” and the “Grey Ware” as defined by the colour of the excavated wares (Majidzadeh 1981). Hence, two distinct phases, the “Plum Ware phase” and the “Grey Ware phase” were associated with periods assumed which brought about changes in societies and the abandonment of settlements in certain areas of the Central Plateau. Malek Shahmirzadi (1995) also later proposed four stages for the cultural sequence of the Central Plateau based on the characteristics of pottery: 1. Formative period, 2. Zagheh period, 3. Cheshmeh Ali period (Sialk I and II) and 4. Wheel-made pottery period (or Sialk III).

These aforementioned traditional methods associated with the study of Iranian Central Plateau’s pottery have led to confusion and misunderstandings. For example, as pottery of a similar colour and decoration is usually classified and named with a single common term, such as Sialk I or II, the exact nature of similarity or difference between different vessels or the discussion of the movement of products, cultural interaction or technology transfer is seldom discussed. This could also result in misunderstandings regarding the nature of socio-economic exchanges between various prehistoric societies, such as the assumption intrusive elements bringing about change in society and the abandonment of settlements (Majidzadeh 1981) or the migration of people into the Central Plateau, importing ceramic manufacture to the region (Malek Shahmirzadi 1995). These propositions were simply based on the discovery of pottery sherds with apparently novel and different colour/decorations in comparison with existing and better known ones.

More recent excavations have utilised scientific analysis methods to gather more accurate and reliable information concerning the chronology and cultural development of the Central Plateau of Iran in the Late Neolithic and Chalcolithic periods. For example, Fazeli et al. (2001) investigated surface collected ceramic sherds from six Late Neolithic to Middle Chalcolithic sites on the Tehran Plain and conducted chemical analysis through Inductively-Coupled Plasma-Atomic Emission Spectrometry (ICP-AE). Their data showed considerable similarity between sites and across time periods, as was expected because of the similarity of clay resources. However, Discriminant Analysis reveals considerable changes in clay composition from the Late Neolithic to the Middle Chalcolithic, and also that the ceramics can be partially separated by site using their chemical composition. More detailed analysis of the data reveals that sherds of the same period can be distinguished chemically by find site. This suggests that each site exploited similar but discrete clay resources, possibly local to each site.

Wong, et al. (2010) also studied Cheshmeh Ali Type wares, a distinctive red ceramic which dates to the Transitional Chalcolithic period and has been found at sites on the Central Plateau in northern Iran, stretching from the Gorgan plain in the east to the Qazvin plain in the west. Her geochemical and petrographic analyses were performed on samples collected from several sites in the Qazvin and Tehran plains to investigate the mode of production and distribution of the pottery. The results suggested local rather than centralised production of Cheshmeh Ali Ware ceramic vessels. Using discriminant analyses, geochemical groupings have been established that differentiate samples of vessels from the two plains, and also samples from different sites within the Qazvin plain. These findings are consistent with the results of the previous study (Fazeli et al. 2001) and are very significant for the understanding of the mode and scale of ceramic production and distribution in this region in the specified period.

Fazeli et al. (2011) also carried out a preliminary paleo-technological study of a collection of well-stratified potsherds excavated in the site of Tepe Pardis in the Tehran plain, which helped explain some of the important technological changes in ceramic production from the Late Neolithic through to the Transitional Chalcolithic (ca. 5200-4600 BC). According to the authors, it seemed that the change from the buff-coloured painted vessels of the Late Neolithic to the red-slipped and black-painted wares of the Transitional Chalcolithic did not involve different raw materials or higher firing temperatures, instead they probably had been fired for longer times and adaptation of more efficiently controlled firing conditions. This development is doubtlessly related to the invention of the sophisticated four-chambered kilns discovered in rows in this specialised ceramic-producing village, the exact functions and technology of which are still unclear. The pottery, to a great extent, was built with a Sequential Slab Construction process, however, coil building was also on record for both large and medium-sized containers since the Late Neolithic, and by the end of the Transitional Chalcolithic.

The authors also reported some positive evidence for the use of an early fast potters' wheel which, despite its very limited use, show that the potters of Tepe Pardis had a basic familiarity with this specialised technique. The co-existence of completely different approaches to the forming of vessels revealed a previously unreported technological intricacy. While contributing to a growing body of ethno-archaeological information, the evidence from Tepe Pardis questions traditional models of the evolution of ancient ceramic technologies in the early farming communities of Middle Asia. The authors claimed that despite the necessity of more research to substantiate their preliminary conclusions, the early evidence of the use of fast wheel throwing in Tepe Pardis, which was among the earliest reported usages at the time of discovery, underlines the key role of the early settlements of the Tehran plain in the development of socio- technical complexity across the Central Plateau.

Considering the above points, it was decided to undertake a more comprehensive and thorough study in order to shed more light on the nature of the socio-economic transformations of the Neolithic and the Chalcolithic settlements within the Central Plateau of Iran. This will be undertaken through the study of the evolution of craft specialisation in the production of pottery from the Late Neolithic through the Transitional Chalcolithic (ca. 5700-4800 BC) periods in the Central Plateau utilising a multidisciplinary research program consisted of more advanced and novel methods of the pottery study.

The results of the present study provide the material basis for investigating the nature of changes in the ceramic production techniques which occurred during the Late Neolithic to Transitional Chalcolithic transition period (ca. 5200-4600 BC) in this area. The study also introduces a more reliable criterion for comparison of various pottery of the Central Iranian Plateau with each other, and to clarify the nature of existing interactions between the prehistoric communities of the region. The methods utilised in the present study are typological classification and more advanced methods such as phylogenetic analyses in which the cladistic methods of phylogenetic reconstruction are applied to data sets comprising the decoration and form of ceramics. This method has been used for the first time in pottery analysis of Iran. It also uses scientific analyses in which ceramics were characterised utilising X-ray Diffraction (XRD), X-ray fluorescence (XRF) and scanning electron microscope (SEM).

4.2 Typological classification and the Phylogenetic analyses of the decoration and form of pottery

4.2.1 Sample selection

This study analyses pottery sherds belonging to various types of Sialk I (Late Neolithic) and Sialk II (Transitional chalcolithic) Ware recovered from the three sites of Ebrahimabad (Trenches I, II and III from the excavations in 2006; Fazeli et.al. 2009), Pardis (Trenches I, II, III, IV, V and VII from the excavations in 2003, 2005 & 2006; Coningham et al. 2006; Fazeli et al. 2007a) and Sialk (Trenches V and VI from the excavations in 2008 & 2009;

Fazeli et al. 2013). Table 1.1 depicts the sequences and dating of the selected pottery of the three sites of Central Plateau and a full and detailed description of these sites was presented in Section 3.3.

As a preliminary stage of the project, the entire assemblages of some 12,000 sherds were inspected and the diagnostic pottery sherds information entered in a database. The recorded information includes sherd thickness, diameter of rims, weight and Munsell colour coding of the surfaces and core (Appendix B) and linear measurements were taken with a calliper (Appendix B). The data set comprises 1619 decorated pottery sherds. Every single sherd has been photographed and the photographs used for the phylogenetic analysis. For the study of typology, illustrations of sherds from these three sites were used, as well as the ceramic illustrations from the earlier Sialk excavations of 1937 (Ghirshman 1938). The details of the analyses conducted on the samples and the results will be discussed in Chapters Six and Seven.

4.2.2 Typological classification

Traditionally, typology has dominated the study of ancient ceramics but now, in general terms, typology is used to refer to the classification of a number of objects that make up part of a homogeneous whole by means of the definition of "types". Type has been broadly defined as “an internally cohesive class of items formally defined by consistent association of attributes (or attribute states) and set off from other classes by discontinuities in attribute states” (Rice, 1987: 484). In the Central Plateau of Iran, the most common means of classifying pottery has been based on decoration, and little attention has been paid to form. Part of this research will focus on the form of pottery, representing the first time that this approach has been attempted within the Central Plateau. Central Iranian Plateau Pottery comes in many types and shapes, hence, in order to better understand the successive evaluations, similarity and difference between various forms of pottery will be described.

The creation of form types and defining criteria by which a typology of pottery shapes can be organised is not a simple task, because there are no absolute parameters or universally accepted systems to refer to. There tend to be two attitudes to this activity: ‘splitting’ and ‘lumping’. The former method results in types and sub-types, which can be as large in number as there are vessels. Adaptation of this approach can lead to an over-complication of the ceramics, creating archaeologically insignificant types that produce misleading interpretations, while the 'lumping' method tends to give very broad definitions, which can encompass large variations in form (PCRG, 2010). Hence, we have tended towards the 'lumping' together of ceramics with similar attributes, such as body, rim and base shape.

In the present study, besides other analytical systems of pottery, the Prehistoric ceramics have also been classified by form. This is the first time that such an approach has been attempted within the Central Plateau. Indeed, although Ghirshman mentioned some forms such as the high cups of Period II (Ghirshman 1938: pl. XLV S.1552), open bowls (Ghirshman 1938: pl. XLVI S.1747) and a small number of new forms such as bowls with inverted rims (Ghirshman 1938: pl. XLVII A2, C2) and thickened, modelled rims (Ghirshman 1938: pl. XLIV A2, C2), he did not try to group together similar forms of pottery and classify them.

It is highly likely that additional forms and variations within forms will be present at other sites, such as Cheshmeh-Ali and Zagheh but they can later be easily incorporated into the collected data of typology which has been developed in such a way that new forms can be added and variations within forms can be expanded, or combined.

4.2.3 Ceramic Catalogue and Analysis Methodology

The ceramics from the individual sites were split into wares and each ware was then sorted into sherd shape, rim and base. Then they were further divided into a number of broad categories: Jars (form J), Bowls (Form B), Beakers (Form BE), Trays (Form T), Bases (Forms F and R) and Dishes (Form D). Each of these categories has been further subdivided, generally along the lines of having open or closed mouths (i.e. B1 and B3). A further subdivision was then made depending on steep or shallow sides (i.e. J1a, J1b). Following the conventions outlined by Coningham and Ali (2007), jars were defined as having heights usually in excess of maximum diameters and orifice diameters less than the maximum body diameters. Bowls and dishes have heights less than maximum diameters, with the maximum diameters usually at the rim. Dishes are significantly less in height and shallower than bowls. There is distinct variability within ceramic forms that were undoubtedly present in most past communities. The reasons behind this variation are diverse and include both technological and social factors (Miller 1985). Variation can merely result from the different potters and production facilities involved in manufacturing similar vessels, utilising different skill-sets, resources and techniques (Sinopoli 1988).

4.2.4 Phylogenetic analysis

To reconstruct historical relationships among the assemblages, I used a phylogenetic approach which was applied to assembled from the Late Neolithic through the Transitional Chalcolithic periods into six groups: Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II. The pottery from the Tepe Chahar Boneh was used as an outgroup (see details below) since based on chronological evidence, as ceramics from the Late Neolithic I phases of the Central Plateau were found only there. After coding, the dataset was subjected to a cladistic analysis. The aim of analysis was to generate a cladogram, or set of cladograms, that best represented patterns of ancestry for the pottery assemblages. This was accomplished with the cladistic search routine of the phylogenetics software programme PAUP* 4 (Swofford 1998). This programme was employed because it is widely used in evolutionary biology. Characters were defined in such a way that they could be scored as either present or absent.

Due to the novelty of the application of phylogenetic analyses methods, originally developed in biology in the reconstruction of the history of human artefacts and the absence of information concerning the application of the cladistic methods of phylogenetic reconstruction to data sets comprising the decoration and form of ceramics in particular, it is appropriate to present a detailed account of the background of this method and its applications in archaeology here.

Background

Over the past quarter century or so, anthropologists have begun to use phylogenetic methods, originally developed in biology, in order to investigate and explain the origin of the cultural diversity characteristic of humanity. Social and behavioural scientists have begun to recognise human culture as an inheritance system, the variation of which has been influenced by both deliberate invention and imperfect copying (Henrich & Boyd 1998; Henrich & McElreath 2003; Mesoudi et al. 2004; Mesoudi 2011). Therefore, cultural transmission like genetic transmission can be expressed by phylogenetic relationships based on "descent with modification" from ancestral forms (O'Brien & Lyman 2000, 2002a; Grandcolas & Pellens 2005; Mace & Jordan 2011). Similar to DNA, the history of cultural changes is recorded in the similarities and differences of character states, or traits, as they are modified over time (Brown & Lomolino 1998).

One of the most dominant methods of classification of the taxa or classes of various datasets which may be comprised of organisms or cultural products, by-products, behaviours, etc. in phylogenetic analysis is the cladistics method. Cladistic analysis reconstructs relationships among taxa (or classes) by determination of the characters that are evolutionarily novel (apomorphic or derived), from those that were present in the last common ancestor of all the taxa under study (ancestral or plesiomorphic). The presence of a derived trait in two or more taxa indicates that they are descended from a more recent common ancestor as compared with the ancestors they share with the other taxa. There are several methods to distinguish between the derived and ancestral taxa, the most popular being outgroup analysis. An outgroup is defined as a taxon that shares a common ancestor with the taxa under study (the ingroup), but is of more distant origin than the ancestor the members of the taxa share with each other. Since the outgroup does not share a common ancestor with any individual member of the ingroup, when a character occurs in two states among the group, but only one of the states is found in the outgroup taxon, the former is considered the derived state and the latter the ancestral state. The next step in a cladistic analysis after determination of the status of change for each character, is the construction of a branching diagram (or tree), known as a character cladogram, that minimises number of evolutionary changes to account for the distribution of derived character states among the taxa (the so-called "principle of parsimony"). .

Some examples of cultural phylogeny

Cultural phylogenetic studies can be divided into three general categories, Firstly, studies that trace lines of transmission, back to a common ancestor and then try to examine the basis of processes, such as geographic distribution and cultural evolution, that affect the descendants (e.g. Atkinson et al. 2008; Kitchen et al. 2009; Tehrani et al. 2010); Secondly, studies in which first some nested taxa (clades) are created and then are mapped geographically (e.g. Tehrani and Collard 2009a, 2009b; Currie and Mace 2011; Bouckaert et al. 2012). Thirdly, studies that first try to understand the patterns of descent to determine whether certain cultural traits are instances of derived or ancestral states (e.g. O'Brien et al. 2001, 2002, 2012; Larsen 2011).

The extent of similarity between the cultural and biological evolutions and the permittivity of linking patterns in the ethnographic and archaeological records with genetic and linguistic data have been the subject of serious discussion and controversy (Tehrani & Collard 2002). One of the earliest expressions of this view is found in the work of Kroeber (1948: 138), who wrote "the course of organic evolution can be portrayed properly as a tree of life, as Darwin has called it, with trunk, limbs, branches, and twigs". Kroeber argued that this pattern is too simplistic for clarifying the complicated course of development of human culture in history. On the tree of life, despite the occurrence of a continuous branching-out, the branches often grow together again, though in their course of growth a branch may approach another branch; but it will not normally coalesce with it. Whereas, on the tree of culture the processes of coalescences, combination and assimilations, are continuously in operation. Some scholars have elicit this contrast by likening cultural patterns to a 'braided river bed' (Moore 1994) or 'entangled bank' (Terrell 1988), instead of the aforementioned tree of life model to describe the development of human culture. They argued that, whereas a new species arises from a single parent species, a new cultural assemblage can derive from multiple cultural parents. According to this view, cultures are temporary collections of traits that are so short-lived that it is impossible to pursue their origin of descent (e.g. Terrell 2004).

The relative importance of two processes that Moore (1994a,b) has termed ‘‘phylogenesis”and “ethnogenesis” has been the subject of extensive discussion. In phylogenesis, a new cultural assemblage is descended from an ancestral assemblage with some modifications, whereas, in ethnogenesis a new cultural assemblage appears via the blending of elements of two or more contemporary assemblages (Collard and Shennan, 2000).

According to the above authors, most researchers considered ethnogenesis as a process of far more importance in the generation of cultural assemblages in comparison with phylogenesis. However, most assessments on the relative importance of phylogenesis and ethnogenesis in human cultures have been theoretical and/or qualitative. To clarify this issue, Collard and Shennan (2000) have applied phylogenetic techniques from biology to assemblages of pottery from Neolithic sites in the Merzbach valley, Germany. The results of these analyses suggest that phylogenesis played an important role in generating the patterns in the pottery assemblages found in the sites. The authors concluded that contrary to some claims, ethnogenesis is not the only process responsible for producing the material culture patterns recorded by archaeologists, and phylogenesis should not be dismissed as a factor in the cultural evolution of past human societies.

Cochrane and Carl (2010) presented the first cladistic analysis of decorated Lapita pottery (3100-2700 BP) which were made and deposited by the prehistoric colonisers of Pacific islands, east of the main Solomon Chain. The authors stated that for several decades the basis of similarities observed between the decorations of Lapita pottery have mainly been analysed through ancestor–descendant relationships of inhabitants of this region and the relative degree of interaction between them. Cladistic analyses have been increasingly used in recent years to study the evolutionary relationships of material culture assemblages in various regions but have not been utilised to analyse Lapita artefacts (Cochrane and Carl, 2010).

The Cladistic analyses conducted on the aforementioned pottery by these authors indicated that a nested hierarchy based on ancestral and derived traits, hence possibly a branching mode of evolutionary change did not explain the variation of presence, absence in the Lapita motifs. In their opinion, cladistics could not be used to investigate datasets where a high degree of horizontal transmission and non-branching evolution have taken place, and noted that the motif variation could be more probably explained by the rapid colonisation of this region and post- colonisation transmission between local populations for 200 or more years (Cochrane and Carl, 2010).

The above authors also utilised NeighborNet and phenetic distance network analyses to explain the Lapita decorative similarity.

NeighborNet analyses indicated no unambiguous grouping or population structure in the motif data, although groups, such as east Fiji–Tonga–Samoa, identified through other research were visible. The authors concluded that their analysis confirmed that horizontal transmission was the best explanation for variation in Lapita motifs in remote Oceania.

Tehrani and Collard (2002) assessed the application of cladistic methods of phylogenetic reconstruction to a data set comprising decorative characters incorporated into textiles produced by the Turkmen tribes of Central Asia since the 18th century to clarify the relative importance of two cultural evolutionary processes, phylogenesis and ethnogenesis. The analyses focussed on two periods in Turkmen history: the first period is the period of nomadic pastoralism in which most Turkmen tribes were organised according to native structures of large associated families; and the second period following their defeat by the Russian colonial regime, which dominated by the sedentarisation of nomadic Turkmen and their dependence on large, extended markets. The analyses indicated that in the pre-Russian period, the evolution of Turkmen woven assemblages was dominated by phylogenesis which accounted for c.70% of the resemblances of tribes' assemblages, while ethnogenesis accounted for c.30%. The analyses also showed that phylogenesis was the dominant process in the Russian period, although ethnogenesis still accounted for an additional 10% of the resemblances. The authors stated that these results were in accordance with those obtained in other quantitative assessments of cultural evolution suggesting that phylogenesis is an important cultural evolutionary process. They also concluded that the ideas recognising ethnogenesis as the only significant process in cultural evolution are not accurate. Rather, the relative importance of the two processes should be assessed and examined case-by-case.

Using data on Iranian tribal populations, Tehrani et al. (2010) also showed how concepts and methods developed in the field of co-phylogenetic studies in biology can be usefully applied to study the long-term coevolution of different inheritance systems in humans. According to Tehrani, though populations branching initiated from their splitting is among the most prominent processes in evolution of human cultures, the branching of craft and tool lineages may not always result from populations splitting. Similar to the gene-culture coevolution in biology studied by co-phylogenetic methods, it is possible to model the historical associations in human material culture by four processes: co-divergence, lineage sorting, duplications and horizontal transfers all of which may play a role in gene-culture coevolution. A quantitative study of cultural evolution in rural Iran revealed that two of the aforementioned processes played a role in the acquisition of weaving traditions in tribal populations. In Turkic groups, it seems that weaving styles and techniques have associated with linguistic splits, suggesting that they may represent a ‘core tradition’ in these populations. Whereas, in Iranian groups it appear that they have adopted weaving styles and techniques as a ‘package’ from incoming Turkic tribes (horizontal transfer). This case study showed that different processes can be involved in the diversification and spread of cultural traditions, and the biological co-phylogenetic methods are powerful tools to discover and explain these processes.

Tehrani and Collard (2012) also studied evolution of tribal textile assemblages in Iran and Central Asia, through cladistic phylogenetic analysis. In this study 122 decorative and technical characters of rugs from six tribal groups, the Yomut, Shahsevan, Qashqai, Boyer Ahmad, Papi and Bakhtiari were analysed. The outgroup in this analysis was a prehistoric Western Asian textile assemblage from the Pazyrk Valley, Siberia, fourth to fifth century BC. The first stage of the analysis inferred the most parsimonious tree for the textile assemblages. In the second stage of the analysis, the goodness of fit with the tree model for decorative characters (n=80) and technical characters (n=42) was compared. The goodness of fit for each set of characters was measured using the Retention Index (RI), which calculates the required number of homoplastic changes (similarities due to other processes than the common descent, such as borrowing and blending) among lineages for a cladogram, regardless of the number of characters in the data. The RI of the complete dataset, comprising the technical and design characters, were all around 0.59, which can be interpreted as strong evidence of phylogenesis (Nunn et al. 2010). The RI values indicated that similarities and differences among the assemblages can be mainly explained in terms of descent (with some modifications) from ancestral assemblages. However, the finding that the phylogenetic signal in design characters is just as strong (if not stronger) than the signal in technical characters seems rather surprising since techniques, like genes, are normally transmitted “vertically” from mothers to daughters, whereas designs are often transmitted “horizontally” among weavers. A more careful examination revealed that the transmission of designs between weavers mainly takes place within, rather than between groups, since communication among members of different groups is often impeded by the existence of ecological boundaries, language barriers, endogamy and xenophobic prejudices, whereas transmission among members of the same group usually is facilitated by their physical proximity, common language and other shared cultural norms (Durham 1992). Hence, contrary to the supposition of some archaeologists and anthropologists’ differences in the ways in which genes and cultural traits are transmitted among individuals should not be assumed to lead to differences in macro-level patterns of evolution (Tehrani, 2012). Tehrani agreed with Durham’s suggestion that the “Transmission Isolating Mechanisms” may constrain the exchange of cultural information among societies in the same way as some isolating mechanisms prevent gene flow between species. Consequently, despite the clear differences between cultural and genetic transmissions at the individual level, cultural evolution at the level of the group may often be very similar to the evolution of species diversity, hence Tehrani (2012) concluded that even the evolution of the studied textile designs had been more influenced by phylogenesis than ethnogenesis.

4.2.4.1 Phylogenetic analyses of pottery decorations

This study will be carried out by applying cladistic methods of phylogenetic reconstruction to a data set comprising the decoration of ceramics from Central Plateau of Iran. The data set comprises details of decorative characters on 2452 ceramic sherds found at Tepe Pardis, Ebrahimabad and Sialk. Every single sherd will be photographed or published drawings or photographs used if the requisite data can be obtained. For each sherd, the state of each character in numerical order 1 through to 66 will be listed (Table 7.8). In this way, the 2452 specimens fall into 96 classes. For the intended analysis, only those classes will be used that contained a minimum of two specimens (66 classes). Repetitive behaviour would be more desirable.

4.2.4.2 Phylogenetic analyses of pottery forms

This study will analyse the evolution of ceramic forms and 1085 forms from Tepe Pardis, Ebrahimabad and Sialk have been classified, which fall into 26 classes. The forms of the specimens will be drawn or the published drawings used if the requisite data can be obtained. For each sherd, the state of each character will be listed in numerical order 1 through to 23 (Table 7.9). For the proposed analysis, as reported here, only those classes will be used that contained a minimum of two specimens (23 classes).The results of the Phylogenetic analyses will be discussed in more detail in Chapter Five.

4.3 Scientific analysis

In this section, the scientific methods used in the research will be discussed. In the past decades, scientific analyses of pottery has formed a useful adjacent to the study of archaeological ceramics and has been used successfully to understand both the manufacturing and development of pottery making. The selected research methodology consists of multidisciplinary work including scientific analysis.

The present study is an attempt to explore the potential of more advanced techniques such as XRF and XRD analysis, along with microstructural studies by SEM/EDX, in characterising the sherds found at Tepe Sialk, Pardis and Ebrahimabad in order to assist the understanding of the social and economic processes in the Central Plateau of Iran.

4.3.1 Sample selection

For scientific analysis, a total number of 86 pottery sherds were selected from the absolute-dated sequences from Sialk, Ebrahimabad and Pardis sites. They included 36 sherds from Silak, 22 sherds from Ebrahimabad and 28 sherds from Pardis. The sherds comprised two different assemblages of Sialk-type pottery. The samples for each assemblage had been randomly selected from the excavated pottery on the basis of their appearance (colour and decoration). The Sialk I pottery samples were selected from the excavated buff pottery group decorated with black-painted simple geometric motifs, and Sialk II samples from the excavated red pottery group decorated with black-painted simple or composite geometric motifs. Tables 4.1-4.3 below exhibit the specification of the selected sherds.
The details of the analyses carried out on the samples and the obtained results will be discussed in Chapter Six.

Table 4.1 Specification of the selected Sialk sherds

Context	Sample	Element	Type	Diameter (cm)	Thickness (mm)	Height (mm)	Weight (gr)	Surface colour	Colour of core
5021	S2a	Rim	B1b	50	6	20	15	10R.5.6 red	Pale brown
5023	S2b	Body	_	_	5	24	5	5YR 6.6 reddish yellow	Red
5021	S2d	Base	R2	10	11	60	111	10YR.7.4 very pale brown	Pale brown
5021	S2f	Rim	B1d	22	5	26	6	10R.5.6 red	Pale brown

5021	S2g	Rim	B1e	29	7	37	14	10R.5.6 red	Pale brown
5007	S2i	Body	_	_	4	34	5	2.5YR.5.6 red	Gray
5021	S2j	Rim	B1c	26	6	46	27	5YR 6.6 reddish yellow	Pale brown
5017	S2k	Rim	B1c	32	5	20	5	5YR 6.6 reddish yellow	Red
5017	S2m	Rim	B1e	36	12	38	14	10R.5.6 red	Pale brown
5026	S2f	Body	_	_	6	55	29	5YR 6.6 reddish yellow	Gray
5097	S2c	Rim	B3b	14	9	52	34	10R 4/6 red	Very pale brown
5089	S2e	Body	_	_	8	44	15	2.5YR 4/6 red	Very pale brown
5088	S2n	Rim	B3c	18	12	53	24	2.5YR 8/4pale yellow	Pale yellow
5095	S1a	Body	_	_	10	41	12	2.5y 8/3pale yellow	Pink
5095	S1b	Rim	B3b	14	8	52	15	2.5yr 8/3 pale yellow	Very pale brown
5095	S1c	Body	_	_	13	27	7	2.5yr 8/3 pale yellow	Very pale brown

5117	S1e	Body	_	_	13	74	38	10YR 7/3 pale brown	Very pale brown
5095	S1l	Rim	B3b	14	9	47	8	2.5yr 8/2pale yellow	Very pale brown
5095	S1n	Body	_	_	10	47	18	2.5yr 8/3 pale yellow	Very pale brown
5105	S1ac	Body	_	_	8	60	19	2.5yr 6/4 red	Very pale brown
5119	S1ad	Body	_	_	10	55	65	10R 4/6 red	Very pale brown
6016	S1d	Rim	B3c	22	7	26	11	10YR 7/3 Pale Brown	Very Pale Brown
6016	S1f	Rim	B3d	36	7	72	28	7.5yr 6/4 light brown	Grey
6032	S1g	Rim	B4a	7	10	38	18	10yr 7/3 Pale Brown	Pale Yellow
6035	S1h	Rim	B1b	23	11	38	51	2.5yr 8/3 Pale Yellow	Very Pale Brown
6034	S1i	Rim	B1a	13	32	40	12	2.5Y 8/3 Pale Yellow	Very Pale Brown
6018	S1j	Rim	B1a	21	37	56	20	2.5yr 8/4Pale Yellow	Pink
6032	S1k	Rim	B1a	18	7	46	20	7.5yr 4/4 Pale Brown	Pale Brown

6013	S1m	Body	_	_	8	33	5	10yr 7/4 very Pale Brown	Pale Brown
6013	S1o	Body	_	_	11	52	25	2.5yr 8/4 Pale Yellow	Pale Yellow
6040	S1p	Rim	B1c	30	10	25	7	10yr 7/4 very Pale Brown	Very Pale Brown
6018	S1r	Rim	B1e	35	7	85	39	5yr 4/4 redish brown	Pale brown
6035	S1s	Rim	B4a	10	5	21	5	2.5yr 3/6 Dark red	Very Pale Brown
6033	S1t	Rim	B3b	14	9	38	10	7.5yr 6/4 light brown	Very Pale Brown
6042	S1u	Rim	B3c	28	10	54	23	2.5yr 6/6 light red	Reddis h yellow
6035	S1q	Rim	B3d	18	11	40	41	2.5yr 8/3 Pale Yellow	Very Pale Brown

Table 4.2 Specification of the selected Pardis sherds

Context	Sample	Element	Type	Diameter (cm)	Thickness (mm)	Height (cm)	Weight (gr)	Surface colour	Colour of core
7018	P1a	Rim	B3d	16	13	37	74	2.5yr 8/3 pale yellow	Very Pale Brown
7023	P1b	Rim	B3d	15	10	25	29	10YR 7/3 pale brown	Very Pale Brown
7023	P1c	Rim	B4b	12	8	45	9	2.5yr 4/3 Reddis h Brown	Very Pale Brown

7023	P1d	Rim	B3c	25	10	56	21	Light gray	Very Pale Brown
7018	P1e	Body	_	_	8	37	7	10yr 7/3 Very Pale Brown	Very Pale Brown
7023	P1f	Body	_	_	10	20	6	10yr 7/3 Very Pale Brown	Very Pale Brown
7021	P1g	Rim	B4a	10	8	28	4	2.5yr 8/3 pale yellow	Very Pale Brown
7021	P1h	Rim	B4b	12	8	48	15	10YR 7/3 pale brown	Very Pale Brown
7018	P1i	Body	_	_	11	25	67	2.5yr 8/2pale yellow	Very Pale Brown
7021	P1j	Body	_	_	12	32	54	2.5yr 8/3 pale yellow	Very Pale Brown
7018	P1k	Body	_	_	10	54	32	10YR 7/3 pale brown	Very Pale Brown
7023	P1l	Body	_	_	13	19	98	2.5yr 8/2pale yellow	Very Pale Brown
7013	P2a	Rim	B4b	11	6	50	87	2.5YR.5 .6 red	Pale Brown
7007	P2b	Body	_	_	5	24	43	5YR 6.6 reddish yellow	Very Pale Brown
7017	P2c	Rim	B1d	19	8	36	76	10R.5.6 red	Pale Brown
7006	P2d	Body	_	_	7	29	65	10R.5.6 red	Pale Brown
7005	P2e	Rim	B4b	11	7	32	49	5YR 6.6 reddish yellow	Very Pale Brown
7017	P2f	Rim	B1b	42	13	69	143	10R 4/6 red	Pale Brown
7005	P2g	Rim	B1b	37	11	46	94	2.5YR 4/6 red	Pale Brown

7017	P2h	Rim	J1c	10	7	26	60	2.5YR 8/4pale yellow	Pale Brown
7015	P2i	Rim	J1b	22	12	38	180	5YR 6.6 reddish yellow	Very Pale Brown
7015	P2j	Rim	B3b	16	9	46	131	10R.5.6 red	Very Pale Brown
7015	P2t	Rim	B3a	21	14	26	98	5YR 6.6 reddish yellow	Very Pale Brown
7015	P2z	Rim	B4b	8	6	28	122	10YR.7. 4 very pale brown	Very Pale Brown
7015	P2v	Rim	B1e	29	11	31	152	10R.5.6 red	Pale Yellow
7004	P2s	Rim	B1b	43	14	52	269	5YR 6.6 reddish yellow	Pale Yellow

Table 4.3 Specification of the selected Ebrahimabad sherds

266	E1t	Rim	B3b	15	6	28	78	2.5yr 8/3 pale yellow	Very Pale Brown
260	E1r	Rim	B3b	19	7	38	94	2.5yr 8/3 pale yellow	Pale brown
248	E1k	Rim	B3b	18	9	42	169	2.5yr 8/3 pale yellow	Very Pale Brown
248	E1l	Rim	B3a	34	12	27	109	2.5yr 8/3 pale yellow	Pale brown
247	E1n	Rim	B3a	18	15	34	201	10YR 7/3 pale brown	Pale brown
246	E1p	Rim	B2b	33	9	26	94	2.5yr 8/2pale yellow	Pale brown
244	E1o	Rim	B2c	10	10	32	89	2.5yr 8/3 pale yellow	Pale brown

157	E1f	Rim	B3b	18	9	52	289	10YR 7/3 pale brown	Pale brown
361	E1c	Rim	B2b	39	9	49	198	2.5yr 8/2pale yellow	Pale brown
361	E1g	Body	_	_	7	52	116	2.5yr 8/3 pale yellow	Pale Brown
349	E1s	Body	_	_	4	28	102	10YR 7/3 pale brown	Very Pale Brown
330	E1u	Body	_	_	9	25	142	2.5yr 8/3 pale yellow	Very Pale Brown
346	E2a	Rim	B3b	21	7	31	132	2.5yr 8/3 pale yellow	Very Pale Brown
355	E2b	Rim	B3c	28	6	43	95	10YR 7/3 pale brown	Pale Brown
349	E2c	Rim	B3b	19	7	49	169	2.5yr 4/3 Reddis h Brown	Very Pale Brown
355	E2d	Rim	B3a	41	14	43	312	10YR 7/3 pale brown	Very Pale Brown
342	E2e	Rim	B2b	28	8	33	112	2.5yr 8/3 pale yellow	Very Pale Brown
214	E2f	Rim	B2a	35	7	51	174	10YR 7/3 pale brown	Pale Brown
214	E2g	Body	_	_	8	25	78	2.5yr 4/3 Reddis h Brown	Very Pale Brown
207	E2h	Body	_	_	12	28	114	10YR 7/3 pale brown	Pale Brown
207	E2n	Body	_	_	4	39	73	2.5yr 8/3 pale yellow	Very Pale Brown

207	E2i	Body	_	_	5	32	74	10YR 7/3 pale brown	Very Pale Brown

Background

Ceramic archaeology has many facets and collaboration between the archaeologist and physical and chemical scientists should develop knowledge of the basic raw materials available to the potters at the stage of technological development within the culture whose ceramic products are being studied. The likelihood that the results will offer clues that help us better understand parts of the culture that produce the pottery are thus increased and justify the approach. Knowledge about many properties of clays, glasses, and glazes, well known to ceramic engineers, can help archaeologists and chemists understand better the pottery studied. A few such properties may be mentioned: chemical and mineralogical composition, colour development, firing temperatures, phase relationships and development, the roles of alkalies and lime in ceramic bodies, macro- and micro-porosity, thermal and impact fractures, moisture expansion, kiln heating rates, atmospheres, temperature variability, etc. (Matson 1981).

There is a range of archaeological evidence indicating that the Transitional Chalcolithic in the north Central Plateau was a period of significant socio-economic development, particularly in terms of the organisation of production. There are also indications of increased complexity in terms of social ranking, long distance trade and specialisation in craft production (Fazeli 2001, 2005). A number of major technological changes in ceramic production appear to have occurred with the commencement of the Transitional Chalcolithic period, including a shift toward the use of standardised raw materials. There is also evidence from several sites for the use of the slow wheel, Chesmeh-Ali (Dipilato and Laneri 1998); Tepe Pardis, (Fazeli et al. 2007a) and fast wheel (Fazeli et al. 2010).

Fazeli et.al (2007a) during their excavation at Pardis in 2006 found a possible ‘‘slow wheel’’or tournette in fired clay, dating back to 4800 BC, and a positive evidence of an early use of fast potters’ wheels also was found at the same site (Fazeli et al. 2010). This wheel utilized not only in the forming of some pottery but also in a set of specialized potting tools. More specifically they examined two pottery sherds belonging to the black-on-red painted pottery of the earlyTransitional Chalcolithic period (Fazeli et.al 2010). The pottery sherds were wall fragments of fine vessels, with quite homogeneous structure and undetermined form, containing only rare and isolated chaff particles. Originally covered by a thick yellowish red slip the paste is reddish yellow (5YR 7/6). Regular bands of parallel fine rotation marks were visible both in the outer and inner surfaces of sherds. In the case of the complete preservation of the surface slip, such bands would have been hidden and invisible.

These 2 potsherds also subjected to more careful XR analysis using the mammographic technique. According to the authors wheel-throwing usually creates distinctive patterns of oblique alignments of elongated voids in the wall of sherds caused by air bubbles trapped in the clay, moreover if the paste includes chaff, their imprints would be oriented in the same fashion. The XR analysis revealed the presence of a series of oblique pores and chaff voids which certainly witnessed the use of the ‘‘fast’’ potter’s wheel in their forming.

Moreover, the authors identified a bowl made with manual techniques (coiling or SSC), and possibly further thinned and fashioned, as a second step, on the wheel; as a case of direct fast wheel throwing (Fazeli et.al 2010).

The evidence of existence and use of ceramic kilns was also discovered in workshop areas (Fazeli et al. 2005, 2007a).

A brief history of ceramics analysis in Central Plateau of Iran will be discussed below.

Chemical analysis of the body composition of 76 sherds from the surface of six Late Neolithic to Middle Chalcolithic sites on the Tehran Plain have already been chemically analysed (Fazeli et al. 2001) by Inductively-Coupled Plasma-Atomic Emission Spectrometry (ICP-AES). Although the sites shared a related surface geology, the study detected subtle chemical changes in body composition, which suggest that ceramic production over the period studied was essentially carried out at the local site scale, with the exception of the development of a commonality of supply to the sites of Mehdikani and Mafinabad during the Early Chalcolithic - perhaps an indication of increasing centralisation. This is an indication of the use of ceramics with different origins in the Transitional Chalcolithic but the sharing of ceramics from the same source by the Early Chalcolithic. This might also suggest a change from independently source material to a collective approach (ibid.). This preliminary study demonstrates the value of chemical analysis of archaeological ceramics as an adjunct to more traditional methods.Cheshmeh Ali Ware continues to form a key cultural and chronological marker for the interpretation of the late prehistoric chronology of northern Iran. In his synthesis of Iranian prehistory, Donald McCown used it as one of the markers for identifying the early cultures of northern Iran, which shared a tradition of painted pottery that can be clearly distinguished from the "buff Ware cultures" in west, south-west and south Iran (McCown 1942). Cheshmeh Ali Ware has since been found in numerous sites in northern Iran stretching from the Qazvin plain in the west to the Gorgan plain in the east (Burton Brown 1979; Voigt and Dyson 1992: 166; Fazeli et al. 2001, 2007a; Coningham et al. 2004, 2006).

Dyson suggest that fine Cheshmeh Ali Ware can be used "to establish a horizon style within western and northern Iran" (Voigt and Dyson 1992: 166.). Between 1997 and 2001, Fazeli conducted new excavations at the sites of Cheshmeh Ali on the Tehran plain and Zagheh on the Qazvin plain. This work was expanded by systematic surveys of the two plains and excavations at the site of Tepe Pardis in the Tehran plain (Coningham et al. 2004; Fazeli et al 2007a). The primary objective of this research was the clarification of the relative and absolute chronology and to examine the development of social complexity during late prehistory in northern Iran. According to Fazeli et al. 2004, 2005 & 2006, Cheshmeh Ali Ware remains the hallmark ceramic tradition of the Transitional Chalcolithic period, which has traditionally been dated to c. 5200-4300 BC, and it is a key element in discussions of technological changes in ceramic production between the Late Neolithic and the Transitional Chalcolithic periods in the northern Central Plateau. The thin wall vessels have been evenly fired, while the thicker-wall vessels often show grey cores.

There has been some debate over the nature and organisation of the production of Cheshmeh Ali Ware, and this has significance for our understanding of the socio-economics of ceramic production and distribution during the Transitional Chalcolithic period. Indeed, there has been disagreement over whether Cheshmeh Ali Ware was produced locally at the village level or whether it was produced at a centralised site or sites and then distributed widely. Based on his initial excavations at Zagheh in the 1970s, Malek Shahmirzadi suggested that the type of clay used for making the Cheshmeh Ali Ware vessels at the site did not match the clay found in the vicinity of the settlement, and concluded that “either the raw material or the finished product was brought to the site from elsewhere” (Malek Shahmirzadi 1977: 281). If this observation is accurate, it has important implications for the organisation of the Transitional Chalcolithic ceramic industry that produced these vessels, and also the development of socio-economic complexity in the Central Plateau, since it would assume centralisation of production and also possible site specialisation (after Rice 1991). According to Arnold, this type of production implies high volume of output with finished products being destined for a supra-regional market (Arnold 1991: 94). Whereas, according to the report on the Late Neolithic to Middle Chalcolithic sites on the Tehran Plain discussed above (Fazeli et al. 2001), there was localised independent production of ceramics during the Transitional Chalcolithic period, with each site potentially producing for its own needs. The above results regarding the analysis on samples from the Tehran plain, was clearly in contrast with previous interpretations of ceramic production in the Qazvin plain, and particulary at Zagheh. However, in the new excavations at Zagheh in 2001, artefacts and material discovered in an area located at the southern section of the settlement, suggest that this area might have been an industrial quarter. (Fazeli et al. 2005: 15). No ovens, walls, floors or burials were found in the area, but there was a high concentration of pottery sherds, including Cheshmeh Ali Ware, together with fragments of finished, unfinished and deformed figurines, spindle whorls, unfired lumps of clay, traces of pigment, and also the remains of kilns in several contexts (ibid.). These artefacts and materials were similar to those found by Malek Shahmirzadeh in what he referred to as the “workshop area” (Malek Shahmirzadeh 1977: 358–76). This raised the possibility that Zagheh might have been a regional production site for Cheshmeh Ali Ware. Fazeli and Djamali subsequently conducted a preliminary petrographic study on samples of Transitional Chalcolithic ceramics collected from Zagheh and Kamal Abad, a site that lies 20 kilometres to the north, and concluded that the clay used for the Cheshmeh Ali Ware samples found at each site was likely to have been obtained from resources close to each settlement (Fazeli and Djamali 2002). Furthermore, comparison of the ceramics from Zagheh and Kamal Abad revealed no significant differences in their petro-fabrics. This provisional study suggested that although ceramic vessels appear to have been made locally in different parts of the Qazvin plain, producers were using similar clay fabrics to make the pottery.

In order to clarify this issue, a study of Cheshmeh Ali Wares from sites located in different parts of north Central Iran have been analysed (Wong, et al. 2010). 42 sherds of Sialk II Ware (Cheshmeh Ali) collected from the excavation at Zagheh (12 samples) and several sites located in different parts of the Qazvin plain, including Zagheh 2 (nine samples), Mahmoodian (five samples), Ebrahim Abad (seven samples), Kamal Abad (five samples) and Zahir Tepe (four samples). It also incorporated samples taken from 20 sherds collected from the surface of the site adjacent to an old trench at Cheshmeh Ali. This study was designed to use a combination of thin-section petrography and bulk chemical compositional analysis using Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) and Inductively Couple Plasma Mass Spectrometry (ICP-MS) to establish the provenance of the Cheshmeh Ali ceramics in the Qazvin plain.

According to the authors, the petrographic analysis confirmed that similar approaches to fabric preparation were being used at the various sites from which samples were analysed, including samples from Cheshmeh Ali and various sites in the Qazvin plain. Apart from four samples, there was no significant difference in the fabric of the ceramics collected from the different sites and it appeared that specific types of raw materials were chosen. When this observation is taken together with the similarity in forms, surface treatment and painted motifs that are evident at sites spread across the north Central Plateau, it can be concluded that there was a high degree of standardisation in the production of Cheshmeh Ali Ware in this region. The discovery of workshop areas at Zagheh and the more consistent coarse: fine void ratio in the petrography of the samples from this settlement supports this hypothesis as it indicates the emergence of specialist pottery production. The presence of “outlier” samples from Kamal Abad, Mahmoodian and Ebrahim Abad does, however, suggest that not all Cheshmeh Ali Ware vessels recovered from some sites were manufactured using raw materials from the same or similar sources. The authors stated that the significance of this finding is difficult to assess with small numbers of samples but it is possible that potters at some settlements made use of more than one distinct source of raw materials. There is also the possibility that these outlier vessels were produced at sites from which we lack other samples, potentially indicating that there was some exchange of vessels. However, the evidence in hand is insufficient for building robust conclusions and the provenance of the outliers will only be resolved from more comprehensive analyses incorporating samples from more sites. It is notable that principle component analysis was not successful in differentiating the samples into site specific groups which might be expected when ceramics are locally produced at sites with very similar geology, as is the case in the Qazvin and neighbouring Tehran plain. However, discriminant analysis, using the find site as the grouping assumption, was able to demonstrate discreet clusters within the Qazvin plain, and distinguishes those clusters from the samples collected at the type site of Cheshmeh Ali, which lies in the Tehran plain. Thus, even though the samples are petrographically similar, the material from some sites is compositionally distinct. Although the analysis incorporated a relatively small number of samples from any one site, the patterning evidence in the discriminant analysis indicates that there were multiple production sites rather than one central production site. The likelihood that there were multiple production locales for Cheshmeh Ali Ware across the north Central Plateau is particularly significant, as the similarity in stylistic and petrographic features is so readily apparent. Such a scenario invites speculation about the mechanisms that would have made the overt sharing of approaches to fabric preparation and vessel decoration possible across such a wide area. It is possible that the apparent standardisation in production is a function of technological transfer that operated as a result of inter-regional interaction that had its roots in the late Neolithic period. This may also have been occurring alongside a diachronic reorganisation of production in the ceramic industry where a household-based production operating during the Neolithic period developed into a workshop-based production system during the Transitional Chalcolithic period. Nevertheless, these workshops do not appear to have operated as centralised pottery production centres manufacturing material for the surrounding region. This indicates that while the pottery production economy involved elements of specialisation, it was not integrated into a broader regional redistribution economy. The evidence for the use of similar fabric recipes, vessel forms and decorative schemes, however, indicates that at the least, potters and the consumers of the pots being produced desired pottery that was similar to that being used at neighbouring sites and in neighbouring regions. This analysis has provided important insight into the specific types of interaction and communication between the Transitional Chalcolithic populations of the north Central Plateau, as there is clear evidence for inter- regional socio-cultural integration, but little evidence of direct and widespread economic interaction, at least in terms of pottery production and distribution.

Utilising the petrographic studies on Zagheh ceramics by Fazeli and Djamli (2003), a more refined classification of temper and clay characteristics is possible. However, studies of 80 samples taken from Zagheh and neighbouring Kamal-Abad have shown that clay used for Cheshmeh Ali type could have been from local sources. The Simple (undecorated) Zagheh type’s temper has a moderate to large amount of organic material and natural silt-sized lithic inclusions from the clay are common, while Painted Zagheh type temper consists of inorganic and organic materials and has a very similar petrofabric to the Crusted type despite variation of the proportion of the components, Crusted ceramics temper consists of both organic and inorganic material and the sand particles are well rounded and medium to coarse in size. Fazeli and Djamli (2003) have suggested that the rough surface of this type may provide a more secure grip and increase heat absorption and evaporation of liquids. The thin walled fine grit tempered vessels are well and evenly fired while the thicker wall vessels show grey cores; Fazeli and Djamli (ibid.) have observed that in Zagheh types firing temperature was likely to be below 800-8500C from the presence of calcareous sandy temper. They further asserted that in Sialk II Ware the calcareous temper has been observed only in very few cases and the empty spaces remained in most of the wares were the result of the decomposition of carbonates present in the sand that had been disassociated due to higher firing temperatures, hence the clays used in the pottery-making could have been of local origin. Therefore, the ceramics were likely to be made locally and not imported from a production centre such as Cheshmeh Ali (ibid.).

A small sample of 13 potsherds from Ebrahim Abad (three samples) and Chahar Boneh (ten samples) also underwent petrographic and geochemical analysis as part of a larger sample group (Wong 2008). These samples were collected from the surface in the survey conducted in the Qazvin plain in 2003. The three samples from Ebrahim Abad belong to the Sialk I Buff Ware and five of the ten samples from Chahar Boneh are brown-on-buff painted Ware and five are undecorated Buff Ware. Petrographic analysis shows that all samples contain moderately high percentage of voids and angular, coarse inclusions. Lime content is also moderate to high. Geochemical analysis shows good clustering into find locations. These findings suggest that during the Late Neolithic period ceramic production was undertaken locally, perhaps household production, with little standardisation in both raw material procurement and subsequent production (Fazeli et al. 2014).

A further study of a collection of sherds excavated at the site of Tepe Pardis (Fazeli et al. 2010) also shows that the two main classes of recovered pottery, the Late Neolithic Buff Ware and the Sialk II wares that distinctively was associated to the Transitional Chalcolithic period were produced with quite similar materials. The manufacturing areas were probably located in the same sedimentary basin. Grog from crushed and ground sherds was occasionally used as a tempering material. The size of chopped chaff particles constantly decreased from the late Neolithic to the Transitional Chalcolithic deposits. While it is a common notion that abundant tempering with chaff – as a fuel-saving technique – allows a faster and safer drying process and more efficient firings, this trend to finer clay mixtures may be also related to the gradual spreading, in time, of the use of the potter’s wheel. In fact, fast rotation puts at a disadvantage the tempering of clay with large-sized inclusions. Although apparently wheel-throwing was used only to a very limited extent, the potters of Tepe Pardis had a basic familiarity with this specialised technique and experimented it with clay mixtures of variable texture and possibly with different forms.

The pottery, to a great extent, was built with a Sequential Slab Construction (SSC) process, the most archaic forming technique so far studied in Southern Asia. However, coil building was also on record for both large and medium-sized containers since the Late Neolithic and, by the end of the Transitional Chalcolithic, its use might have spread to other ceramic forms. In fact, Tepe Pardis shows a somewaht surprising range of different pottery forming techniques. Other ceramic forming techniques identified with confidence are 2-step moulding within baskets and shaping by beating onto convex moulding surfaces, most probably obtained, as ethnographic examples might suggest, from broken or unbroken globular pots.

The preliminary study of the assemblage of sherds actually suggests that SSC, coil-building and fast wheel throwing might have coexisted much longer than expected. There would be no ‘‘slow wheel’’ forming technology to represent a convenient evolutionary ancestor for fast wheel throwing. Although traditionally each technical approach to pottery forming is seen as an alternative, it is very probable that, in many instances, the combination of different techniques were also in use. The find of a series of ceramic scrapers and/or polishers in Transitional Chalcolithic layers underlines the specialised nature of Tepe Pardis as a ceramic producing centre. The production of a grog temper, the possible use of upturned pots as moulds and the recycling of sherds for making specialised ceramic tools are expression of an expedient, resource-optimising approach to craft production. One of the tools was clearly used, on different edges, for 2 different technical tasks. The wear on one of the sides is fully compatible with polishing the surface of a fast rotating vessel. In this latter case, the potter’s wheel was already used as a vertical lathe. Chalcolithic wares, painted and unpainted, were fired at least to a great extent in a two-step process. Firstly in strongly reducing atmospheres and then in strongly oxidised conditions. Although part of the products from the lowermost layers also seem to have been fired in that way, too, the widespread experimentation of this technique must have been tied to the invention of the sophisticated multiple-chamber firing installations or kilns excavated at Tepe Pardis, whose precise functioning remains to be cleared. In the considered range of time, painted pottery became more and more popular. Elementary statistics on the variation (across the sequence, in time) of the width of brushstrokes indicate that potters became gradually more competent, as the designs became gradually finer and more complex.The authors concluded that despite the limited number of sherds studied, the evidence of a fast-wheel forming process at Tepe Pardis ranges among the earliest so far proposed in the Iranian Plateau and across the whole of South and Middle Asia. It suggests that the fast wheel was (at least) a Late Neolithic invention. It is clear that in the fifth millennium BC at Tepe Pardis, an evident progress in the selection and preparation of clays and in the forming processes well matched the invention of the new multi-chambered kilns. Though, the hypothesis that Chalcolithic wares were fired at higher temperatures than the previous Neolithic vessels was not confirmed by the first analytical results. While Late Neolithic wares were already fired at temperatures equal or above 850 °C, they are clearly more brittle, porous and soft than the later Transitional Chalcolithic wares. Most probably, thanks to the new kilns and the finer, uniform vegetal temper, Transitional Chalcolithic wares were fired more efficiently, for longer times and in more controlled conditions. In particular, as about 30% of the Transitional Chalcolithic potsherds show a reduced core, the vessels were first systematically fired in strongly reduced conditions, thus lowering the temperature required for a partial syntherisation of the clay pastes and the painted designs, and then exposed to strongly oxidised atmospheres, turning the vessels red but not the partially vitrified pigment, that remained black.

Tepe Pardis appears to have been a specialised pottery producing village (Fazeli et al. 2010) and according to the authors of current evolutionary models, it might be viewed as a case of ‘‘workshop industry’’. Such craft organisations would be distinguished by increased scale and efficiency of production by part-time or full-time specialists, often active in small-scale family workshops. There would have been a high rate of technical innovation, increasing standardisation and substantial improvements in firing technologies. On the Iranian Plateau as well as in Central Asia, the fifth millennium BC is marked by the appearance of larger, multi-roomed houses, a sign of the emergence of ‘‘extended families’’ as the most important co-residential unit. While new excavations and studies are needed to understand how ceramic production could be organised in the multi-roomed buildings of Tepe Pardis, the possible existence of forms of sex-age specialisation and the role of seasonal variations, there is no doubt that such a theoretical model well fits the present archaeological evidence. Previous models have often emphasised the role of technical innovation in ceramic production as depending upon, or promoting political centralisation. In particular, the traditional notion is that fast wheel throwing and moulding emerged in the second half of the fourth millennium BC in correspondence with the formation of the first early South and Middle Asian states, and with the emergence of new, sharp social hierarchies. According to the above authors, the evidence now suggests that the Transitional Chalcolithic potters of Tepe Pardis were familiar with a form of fast potter’s wheel, applied incipient forms of moulding and had very advanced firing facilities since at least 5000 BC. Technical progress in this light might be seen as one of the variables involved in the growth of social complexity but hardly as one of its causative factors.

4.3.2 Chemical analysis

There are many different techniques that can and have been used for the chemical analysis of archaeological artefacts. In this research, we used X-ray fluorescence (XRF) technique. The XRF spectrometer is an X-ray instrument used for routine, relatively non-destructive chemical analyses of rocks, minerals, sediments and fluids. XRF analysis is useful for investigating about 80 elements present in major quantities (Rice 2005: 394; Pollard et al. 2007: 101).

Sample preparation of chemical analysis

The most common form of sample preparation is to make pressed powder pellets. In order to prepare them, first the sherds were broken and the resulting fragments were crushed into a coarse gravel. This material was then ground using a Tema Laboratory Disc Mill, with a tungsten carbide barrel. Grinding usually took three to four minutes until a very fine powder was obtained. The pellets in this research consisted of 12 grams per sample. Then, between five and seven drops of a binding wax were added as a binding agent. All powdered samples were pressed into briquettes using a Specac's Atlas series hydraulic press operating at 5 -7 ton/in^2. The briquettes were dried in an oven at 110 °C for one hour. These discs were then placed in the sample holder of the XRF spectrometer. Running a series of standards or known samples helps confirm that the chosen procedure results in accurate, reproducible data. The analysis was carried out in the conservation laboratories of the Department of Archaeology at Durham University on Oxford Instrument ED2000.

A Principal Component Analysis (PCA) was also carried out on the XRF chemical composition data utilising the statistical package SPSS v.21. For the statistical analysis silicon oxide (SiO_2), aluminium oxide (Al_2O_3), iron oxide (Fe_2O_3), magnesium oxide (MgO), calcium oxide (CaO), potassium oxide (K_2O) and titanium oxide (TiO2) have been used.

A correlation matrix was used in the PCA analysis and a plot was drawn representing the variation of the second principal component against the fist component using the analysis results.

4.3.3 Mineralogical analysis

The study of the thermal behaviour of ancient pottery has always attracted much attention in archaeological sciences because it yields useful information about the technology of making and firing of ancient pottery. X-ray Diffraction (XRD) is one of the most popular techniques for identifying the minerals present in ceramics (Rice 2005: 382-386; Pollard et al. 2007: 103). The identification of the type and nature of the minerals present in the ceramics by XRD can be used in the determination of the firing history of the bodies. Because the mineralogical composition of clays changes during firing process at certain specific temperatures, the identification of the minerals that are formed in a body after firing, utilising the XRD analysis, can be used to estimate firing temperature. These changes normally are comprised of the loss of water from the clay minerals and various hydroxides, the decomposition of the carbonates with loss of CO_2 and the formation of various new crystalline minerals. Therefore, XRD analysis has constantly been of major interest in determining firing temperature of ancient ceramics (Holakooei et al. 2014).

Sample preparation and conditions of XRD analysis

A small piece of each body was cut and ground in a Tema Laboratory Disc Mill, with a tungsten carbide barrel. Diffraction data were collected at ambient temperature (295 K) over the range 5-120° (2θ) using a PANalytical X'pert Multi-Purpose Diffractometer equipped with a Cu-Kα1 X-ray source and a PIXcel solid-state detector. The step-scan size was approximately 0.013° in 2θ and the total acquisition time per pattern was 40 minutes.

Identification of mineral phases from the XRD patterns was performed by hand using search-match with obtained from International Centre for Diffraction Data (ICDD).The final plot of the powder pattern was created using Microsoft Excel software on raw data text files. The Powder Diffraction File (PDF) were used to interpret the patterns. The results of XRD analysis are represented in detail in Chapter Six.

4.3.4 Microstructural Examinations

Scanning electron microscopy (SEM) analyses the surface of materials and provides detailed high-resolution images of the sample by rastering a focussed electron beam across the surface and detecting secondary or backscattered electron signal. An Energy Dispersive X-ray Analyser (EDX or EDA) is also used to provide elemental identification and quantitative compositional information (Pollard et al. 2007: 109).

In this research, in some cases, X-ray mapping of specimens were also created. In this way, the whole surface area analysed was systematically mapped in terms of mineralogy or elemental composition and the resultant data provided a false colour mineralogical/compositional map of the sample. In addition, the compositional data was reported as modal mineralogy in area %, along with the size of each discrete mineralogical component.

Sometimes the nature and extent of the changes occurred during the firing process in ceramics, such as the estimation of the degree of vitrification within the clay matrix of ceramics can also be observed and determined by SEM. In this study, the samples were subjected to SEM examination (Hitachi TM-3000) and phase compositions of certain zones in the microstructures were determined by an EDX (Swift ED) attached to the SEM. For this kind of SEM analysis, no preparation of samples was needed.

4.4 Conclusion

This chapter has presented and discussed the methodologies used in this study including the typological classification and scientific analysis, as well as phylogenetic analyses. Based on this outline, this study will explore the organisation of the production of ceramics during the Late Neolithic and the Transitional Chalcolithic periods in the Central Plateau of Iran. The next chapter will present and analyse the typological and phytogenic analysis of the collected data.

Chapter 5: Data Analyses of Form and decoration of pottery

5.1 Introduction

After the presentation of the methodology for the selection, presentation and characterisation of samples obtained from the recent excavations at the sites of Sialk, Ebrahimabad and Pardis in Chapter Four, Chapter Five will now provide the data analyses of form and decoration of pottery, thus assisting the fulfilment of the third and fourth objectives of the thesis.

In this chapter, the results of the data analysis of selected prehistoric ceramics are presented and the data is split into two sections. Firstly, the results of the typological classification and, secondly, the results of the phylogenetic analysis are presented. To the best of our knowledge, this is the first time that such an approach has been attempted for the Central Plateau of Iran. This analyses includes ceramics recovered from Ebrahimabad during the 2006 excavations (Fazeli et.al. 2009), from Pardis during the excavations in 2003, 2005 & 2006 (Coningham et al. 2006; Fazeli et al. 2007a) and from Sialk during the excavations in 2008 and 2009 (Fazeli et al. 2013).

5.2 Typological classification

As already discussed in Section 4.2.3, ceramic forms have been divided into a number of broad categories: Jars (form J), Bowls (Form B), Beakers (Form BE), Trays (Form T), Bases (Forms F and R) and Dishes (Form D). The detailed categories will be discussed further below:

JARS

Form J1

J1a

J1a is a jar with a shallow shoulder (45-75º angle) with an everted rim. These vessels were found at Tepe Pardis. The vessel orifice diameter ranges from 13 to 25 centimetres and vessel thickness from 5 to 9 millimeters. However, very few complete examples were recovered and their overall form and function are not known although they may have had a storage function. They are decorated with geometric patterns on their exterior although one sample, form J1, is undecorated.

J1b

J1b is a jar with a steep shoulder (<45º angle) leading to an everted rim and date to the Transitional Chalcolithic. These vessels were found at Tepe Pardis. Very few complete samples were recovered and their overall form and function are not known. They are largely decorated with geometric patterns on their exterior, although one sample is decorated on both the interior and exterior. The orifice diameter ranges from 12 to 42 centimetres and vessel thickness from 4 to 24 millimetres.

J1c

J1c is a Jar with a steep shoulder (75º to ~90) with an everted rim. These vessels were found at Tepe Sialk and Tepe Pardis. The vessel orifice diameter ranges from 9 to 12 centimetres and the thickness from 6 to 10 millimetres. However, they are undecorated.

Form J2

J2 is a jar with a flared rim and curved neck. Two of the sherds have geometric decoration on their exterior, and two were undecorated. The vessel orifice diameter ranges from 7 to 27 centimetres and the thickness from 4 to 10 millimetres. The overall form and function of the vessels remains unclear. These vessels were found at Tepe Sialk and Tepe Pardis.

BOWLS

Form B1

B1a

B1a is a closed bowl with a curved body and a low shoulder (45-75º angle). There is some variation in rim form due to the thickness of vessels. The sherds are nearly all decorated with geometric patterns on their exterior, except for one undecorated. The vessel orifice diameter ranges 12 to 60 centimetres and the thickness from 3 to 26 millimetres. These vessels were found at Tepe Pardis, Tepe Sialk and Tepe Ebrahimabad.

B1b

B1b is a closed bowl with a curved body and a steep shoulder (75^{o} to near vertical angle). They are primarily decorated with Geometric designs on the exterior of the sherds, although one sherd has anthropomorphic designs, and five are decorated on both the exterior and interior sides. Only two sherds were undecorated. The vessel orifice diameter ranges from 11 to 53 centimetres and the thickness from 2 to 17 millimetres. Despite the high number of sherds, no complete vessels were found, hence, the overall form and function of the vessels is unknown, although it is likely that they represent shallow, slightly convex bowls. These vessels were found at Tepe Pardis, Tepe Sialk and Tepe Ebrahimabad.

B1c

B1c is a closed bowl with a steep and straight shoulder (75^{o} to near vertical angle) leading to a pronounced curving body. They are principally decorated with geometric patterns on their exterior, although one sherd has floral designs. The vessel orifice diameter ranges from 10 to 35 centimetres and vessel thickness from 3 to 10 millimetres. No complete vessels were recovered, hence, the overall form and function is unclear. These vessels were found at Tepe Pardis and Tepe Sialk.

B1d

B1d is a closed bowl with a steep shoulder to globular body leading to a narrow flat base. These vessels were found at Tepe Sialk. They are largely decorated with geometric patterns on the exterior of the vessel. The vessel orifice diameter ranges from 13 to 25 centimetres and sherd thickness from 4 to 10 millimetres. The function of these vessels is unknown.

B1e

B1e is a closed bowl with a steep and virtually straight shoulder (75º- near vertical angle) leading to a gently curving body. These vessels were found at Tepe Pardis, Tepe Sialk and Tepe Ebrahimabad. They are largely decorated with geometric patterns on the exterior of the sherd, although one example has both geometric and animal designs on the exterior, and two have geometric patterns on both the interior and exterior. The vessel orifice diameter ranges from 13 to 44 centimetres and sherd thickness from 4 to 14 millimetres. No complete examples were found and as such the overall form and function of these vessels is unknown.

Form B2

B2a

B2a is a closed bowl with a shallow shoulder (45-75º angle) with a flattened rim. These vessels were found at Tepe Sialk and Tepe Ebrahimabad. The vessel orifice diameter ranges from 13 to 40 centimetres and vessel thickness from 5 to 9 millimetres. Very few complete samples were recovered and their overall form and function are not known although can have a storage function. They are undecorated.

B2b

B2b is a closed bowl with a steep shoulder (<45º angle) with a flattened rim. These vessels were found at Tepe Sialk and Tepe Ebrahimabad. The vessel orifice diameter ranges from 13 to 40 centimetres and vessel thickness from 5 to 9 millimetres. Very few complete samples were recovered and their overall form and function are not known although can have a storage function. They are undecorated.

B2c

B2c is a closed bowl with a steep shoulder (75º to near vertical angle). These vessels were found at Tepe Sialk and Tepe Ebrahimabad. The vessel orifice diameter ranges from 9 to 12 centimetres and vessel thickness from 6 to 10 millimetres. However, they are undecorated.

Form B3

B3a

B3a is an open bowl with a shallow, inwardly sloped (45-75º angle) straight-sided body. All but one of the sherds is decorated with geometric patterns, but the place of decoration varies and decorated on the interior. This is the most varied of all forms in terms of decoration. The vessel orifice diameter ranges from 15 to 45 centimetres and sherd thickness from 3 to 23 millimetres. In terms of function, analogies from other sites indicate that these vessels were large, shallow bowls. These vessels were found at Tepe Ebrahimabad, Tepe Pardis and Tepe Sialk.

B3b

B3b is an open bowl with a rounded and flared rim and a straight or slightly concave neck. They are all decorated with geometric designs on their exterior. The diameter of the bowls ranges from 14 to 21 centimetres and vessel thickness from 4 to 9 millimetres. The overall form and function of the vessels remains unclear, although it is likely that they are storage jars. These vessels were found at Tepe Ebrahimabad, Tepe Sialk and Tepe Pardis.

B3c

B3c is an open bowl with a shallow inwardly sloped (45-75º angle) gently curving body. There is little or no variation in rim form. Decoration is varied, with one sherd with geometric designs on its exterior, and another with geometric designs on both interior and exterior sides. A further sherd has floral patterns on its exterior, and two sherds are undecorated. The vessel orifice diameter ranges from 16 to 35 centimetres and sherd thickness from 5 to 10mm. Analogies from other sites suggests that these sherds represent small to medium sized, shallow, convex bowls. These vessels were found at Tepe Ebrahimabad, Tepe Pardis and Tepe Sialk.

B3d

B3d is an open bowl with a steep shoulder and vertical straight shoulder (75º to near vertical angle). These vessels were found at Tepe Ebrahimabad and Tepe Sialk. These vessels have geometric decoration on their exterior. The vessel orifice diameter ranges from 12 to 45 centimetres and sherd thickness from 4 to 12 millimetres. Although no complete vessels were identified, the overall form is well established, and analogies from other sites indicate that these sherds represent medium-sized shallow bowls.

B3e

B3e is an open Bowl with a rounded and flared rim inwardly sloped (45-75º angle) and a curved neck leading to a Flat-bottomed base. Further similarities are found in Sialk Period I (Ghirshman 1938: Pl. XXXIX. #1426). These bowls appear at Tepe Pardis and Sialk. They are decorated with geometric patterns on the exterior of the pottery. The vessel orifice diameter ranges from 14 to 28 centimetres and sherd thickness from 5 to 12 millimetres.

Form B4

B4a

Open bowl with a steep and straight shoulder (75º to near vertical angle) leading to a pronounced curving body with flat base. These bowls appear at Sialk. They are largely decorated with geometric patterns on the exterior of the pottery. The vessel orifice diameter ranges from 5 to 10 centimetres and the sherds thickness from 6 to 10 millimetres.

B4b

B4b is an open bowl with a steep, inwardly sloped (75º to near vertical angle) gently curving body. These vessels were found at Tepe Ebrahimabad, Tepe Pardis and Tepe Sialk. The vast majority have geometric decoration on their exterior, although there are some exceptions. One has geometric designs on its interior, four have geometric designs on both interior and exterior sides, one has animal designs on the interior and exterior sides of the sherd, three have floral designs on the exterior, and four sherds were undecorated. The vessel orifice diameter ranges from 5 to 15 centimetres and the sherd thickness from 3 to 10 millimetres. Although no complete vessels were identified, the overall form is well established.

Form B5

B5 is an open bowl with a steep, inwardly sloped (75° to near vertical angle) straight-sided body. These bowls appear at Tepe Pardis, Sialk and Ebrahimabad. They are largely decorated with geometric patterns on the exterior of the pottery. Similarities are found in Sialk Period I (Ghirshman 1938: Pl. XXXIX. #1512, #1647). The vessel orifice diameter is in the range of 12 to 35 centimetres and sherd thickness from 2 to 25 millimetres.

Form B6

B6 is a closed bowl with a steep shoulder and globular body leading to a narrow pedestal base. Only one complete example was identified at Tepe Pardis but it is possible that some ceramics within rim form B1a may represent incomplete examples of this form. It has geometric patterns on its exterior surface. Its function is not clear.

Trays

Form T1

T1 is a tray bowl with a slightly rounded and inwardly flaring rim and thick angular carination in the middle of its body. They were recovered at Tepe Pardis and Sialk. None of the vessels are decorated. The vessel orifice diameter range is from 16 to 28 centimetres and sherd thickness from 4 to 5 millimetres. They are one of the most consistent vessel forms within this typology. Their overall form and function is unclear.

Form T2

T2 is a tray bowl with a vertical wall rising to slightly flattened and rounded rim. The base rises to a central piercing, and the exterior of the base is angular. There is a possibility that they are not bowls, but stands. Two vessels of form T2 were found at Tepe Pardis, only one of the vessels was decorated, with geometric patterns on the exterior. Both vessels have a rim diameter of 24centimetres, although sherd thickness vary from 12 to 24 millimetres. Again, they are one of the most consistent vessel forms within this typology. However, whilst their overall form is well established, their function is unclear.

Form T3

T3 is an open tray bowl with a straight and inwardly sloping body to flat base. This bowl show similarities with a vessel from Sialk Period I (Ghirshman 1938: Pl. XXXIX. #1310), although the Sialk vessel has a pronounced inverted rim. Two sherds of Form T3 were recovered from Tepe Pardis. The sherds are undecorated. The vessel orifice diameter ranges from 24 to 30 centimetres and sherd thickness from 12 to 18 millimetres.

Beakers

Form BE1

BE1 is a beaker with a steep and vertical straight shoulder (75^o to near vertical angle) leading to a Flat-bottomed base. They are similar to goblets, but have a much shorter neck, and consequently the vessels are wider in relation to their overall height. These beakers appear at Tepe Pardis and similarities are found in Sialk Period II (Ghirshman 1938: Pl. XLV, #1603, #1552). These complete vessels from Sialk are all entirely straight-sided with flat bases, suggesting a degree of homogeneity. They are principally decorated with geometric patterns on their exterior. The vessel orifice diameter ranges from 10 to 14 centimetres and sherd thickness from 6 to 10 millimetres. The fineness of the sherds and analogies from other sites suggest that this form represents small beakers, possibly tableware.

Dishes

Form D1

D1 is a shallow dish with a very shallow inwardly sloped (<45^o angle) straight-sided body. There is some variation in rim form. These vessels show similarities with a vessel from Sialk Period II (Ghirshman 1938: Pl. XLVI,

#1747). They were recovered at Tepe Pardis and Sialk and Ebrahimabad. Three of the sherds have geometric patterns on the exterior, one has geometric patterns on both sides and the last sherd is undecorated. The dish orifice diameter ranges from 13 to 36 centimetres and sherd thickness from 5 to 12 millimetres. Analogies from other sites suggest that this form represents shallow bowls or dishes.

Bases

Form R1

R1 is a ring-footed base leading to a steep (<45º angle) body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. Base diameters range from 3 to 24 centimetres and thickness from 4 to 13 millimetres. The overall form of the vessels is unknown, and it is likely that these bases may represent multiple overall vessel shapes. These vessels were found at Tepe Ebrahimabad, Tepe Sialk and Tepe Pardis.

Form R2

R2 is a ring-footed base leading to a shallow (45-60º angle) body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. These vessels were found at Tepe Ebrahimabad, Tepe Sialk and Tepe Pardis. Base diameters range from 3 to 18 centimetres and thickness from 3 to 11 millimetres. The overall form of the vessels is unknown, but from site analogies it is likely that these bases are from bowls of varying forms.

Form R3

R3 is a ring-footed base leading to a slight inward carination and steep (<45º angle) body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. Base diameters range from 5 to 11 centimetres and thickness from 4 to 15 millimetres. These vessels were found at Tepe Sialk and Tepe Pardis. The overall form of the vessels is unknown, but from site analogies it is likely that these bases are from bowls of varying forms.

Form R4

R4 is a ring-footed base leading to a slight inward carination and shallow (45-60º angle) body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. Base diameters range from 3.5 to 17 centimetres and thickness from 3 to 10 millimetres. These vessels were found at Tepe Ebrahimabad, Tepe Sialk and Tepe Pardis. The overall form of the vessels is unknown, and it is likely that these bases may represent multiple overall vessel shapes. Eleven of the bases are undecorated.

Form F1

F1 is a flat-bottomed base leading to a steep (<45º angle) straight-sided body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. Base diameters range from 7 to 25 centimetres and thickness from 9 to 21 millimetres. All of the bases are undecorated. These vessels were found at Tepe Sialk and Tepe Pardis. The overall form of the vessels is unknown, and it is likely that these bases may represent multiple overall vessel shapes.

Form F2

F2 is a flat-bottomed base leading to a shallow (>45º angle) straight-sided body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. Base diameters range from 3 to 9 centimetres and thickness from 3 to 10mm. The overall form of the vessels is unknown, and it is likely that these bases may represent multiple overall vessel shapes. These vessels were found at Tepe Sialk and Tepe Pardis.

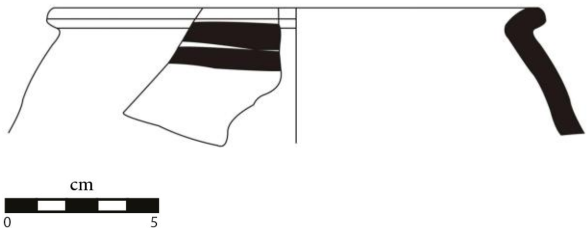
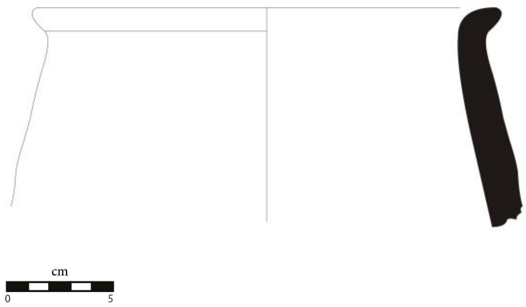
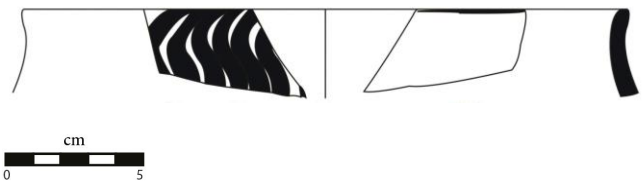
Form F3

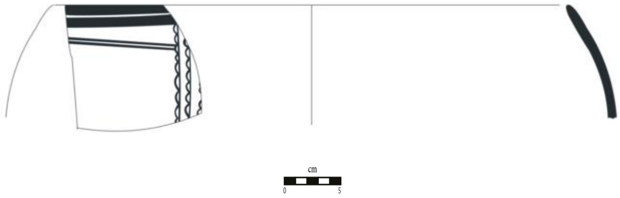
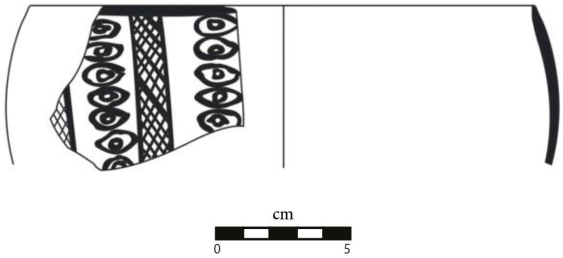
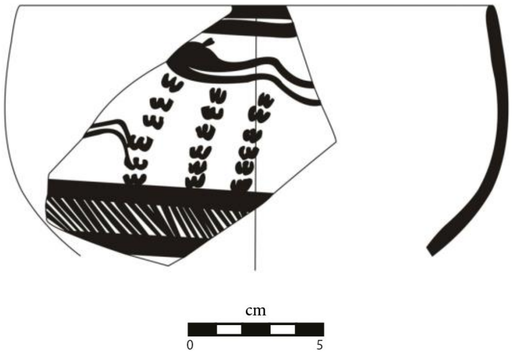
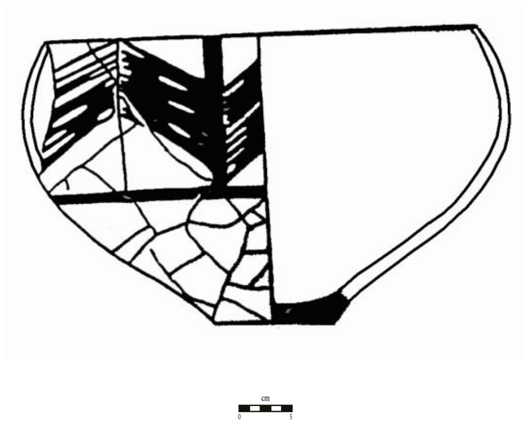
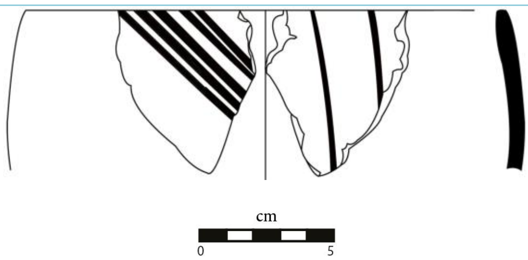
F4 is a flat-bottomed base leading to a shallow (>45º angle) inwardly curving body. Analogies are difficult to identify as this corpus of bases may represent multiple body shapes. The overall form of the vessel is unknown, and it is likely that the base may represent a multitude of overall vessel shapes.

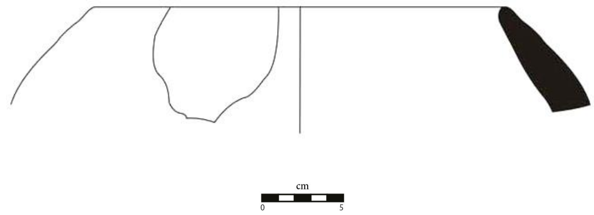
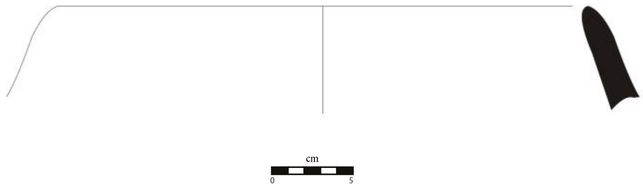
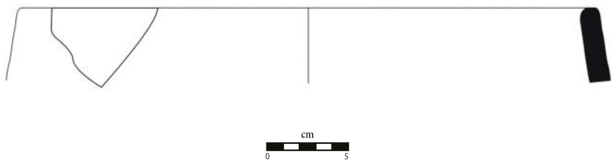
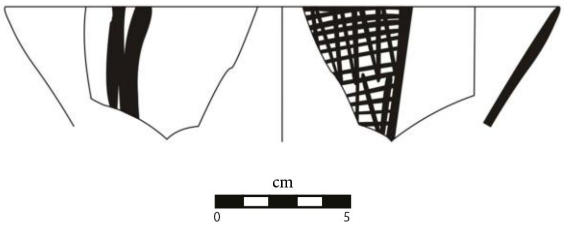
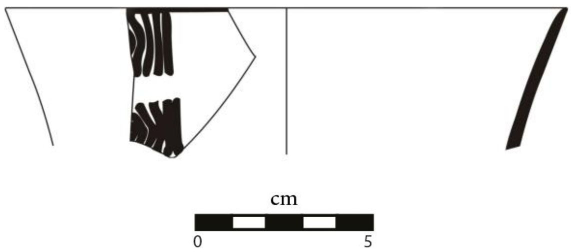
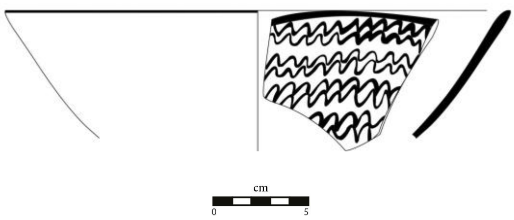
These vessels were found at Tepe Ebrahimabad, Tepe Sialk and Tepe Pardis.

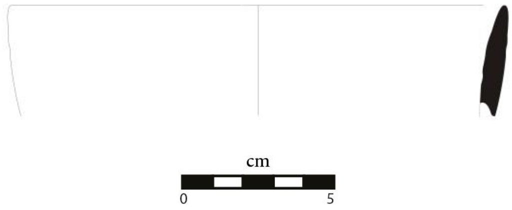
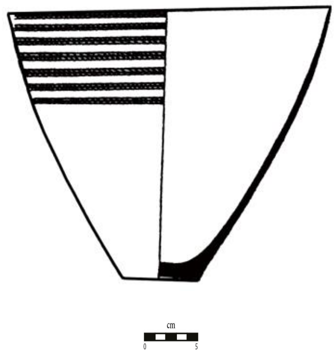
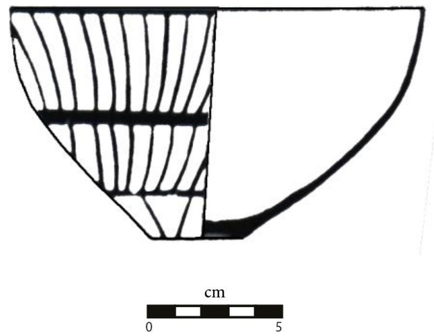
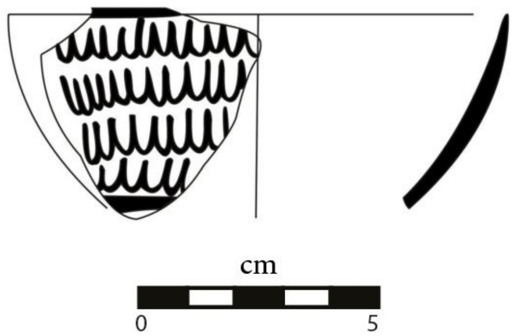
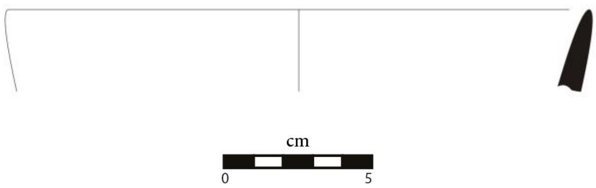
The assembly of the three sites' pottery has been shown in Table 5.1. In this Table a selective ceramics drawings showing the common rim and base types have been presented.

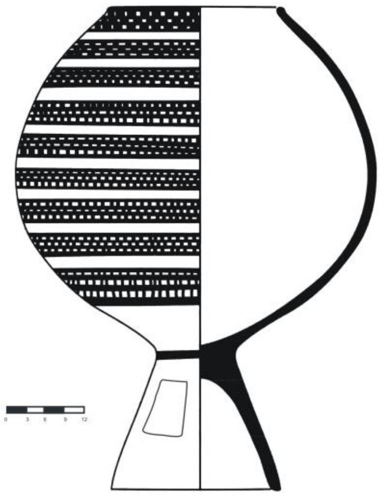
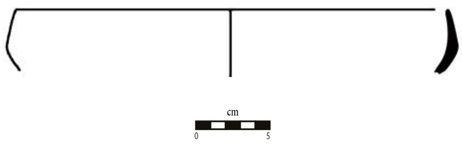
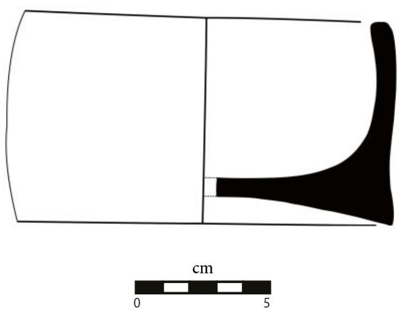
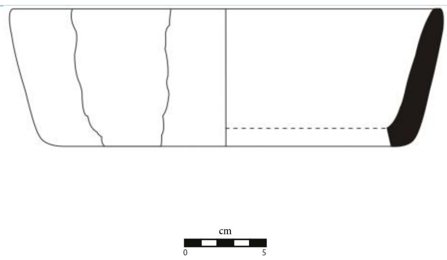
Table 5.1 Rim and Base typology of selected pottery

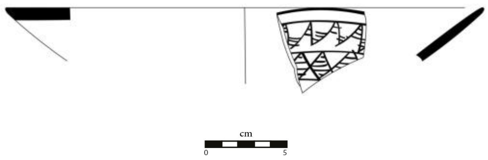
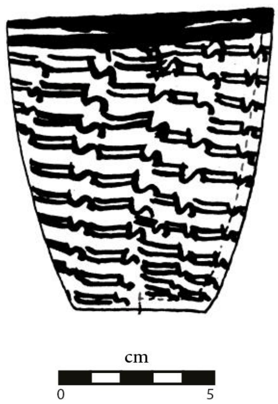
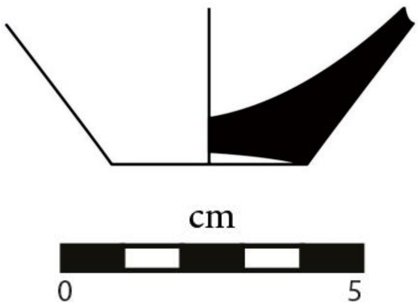
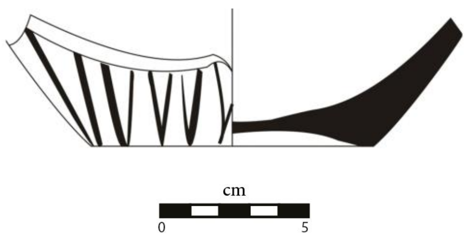
Form J	**Description**	
J1		
J1a	*Jar with a shallow shoulder (45-75 ° angle) with everted rim.*	
J1b	*Jar with a steep shoulder (<45 ° angle) with everted rim.*	
J1c	*Jar with a steep shoulder 75 ° to near vertical angle) with everted rim.*	
J2	*Description*	
J2	*Jar with a flared rim and curved neck, possibly leading to an s-shaped body.*	

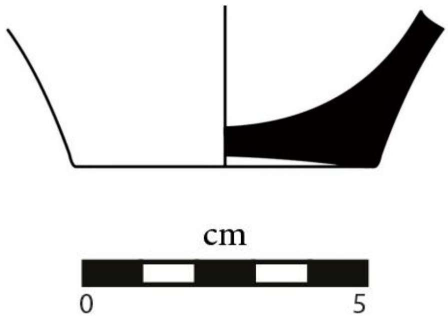
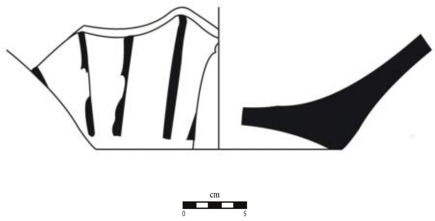
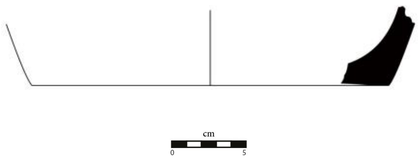
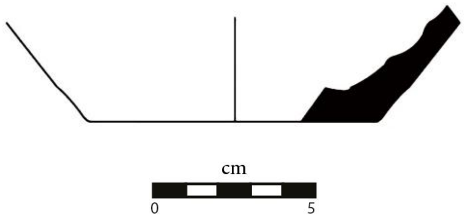
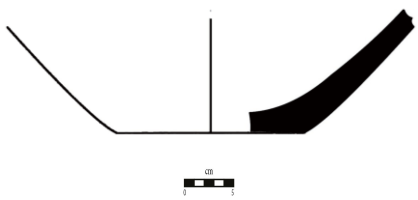
Form B B1	Description	
B1a	*Closed bowl with a curved body and a low shoulder (45-75^{o} angle).*	
B1b	*Closed bowl with a curved body and a steep shoulder (75^{o} to near vertical angle).*	
B1c	*Closed bowl with a steep and straight shoulder (75^{o} to near vertical angle) leading to a pronounced curving body.*	
B1d	*Closed bowl with a steep shoulder to globular body leading to a narrow flat base.*	
B1e	*Closed bowl with steep and virtually straight shoulder (75^{o} to near vertical angle) leading to a gently curving body.*	

B2	Description	
B2a	*Closed bowl with a shallow shoulder (45-75 ^{o} angle) with a flattened rim.*	
B2b	*Closed bowl with a steep shoulder (<45 ^{o} angle) with a flattened rim.*	
B2c	*Closed bowl with a steep shoulder (75 ^{o} to near vertical angle).*	
B3	*Description*	
B3a	*Open bowl with a shallow, inwardly sloped (45-75 ^{o} angle) straight-sided body.*	
B3b	*Open bowl with a rounded and flared rim and a straight or slightly concave neck.*	
B3c	*Open bowl with a shallow inwardly sloped (45-75 ^{o} angle) gently curving body.*	

B3d	*Open bowl with a steep and vertical straight shoulder (75 ^{o} to near vertical angle).*	
B3e	*Open Bowl with a rounded and flared rim inwardly sloped (45-75 ^{o} angle) and a curved neck leading to a Flat-bottomed base.*	
B4	*Description*	
B4a	*Open small bowl with a steep and straight shoulder (75 ^{o} to near vertical angle) leading to a pronounced curving body.*	
B4b	*Open small bowl with a steep, inwardly sloped (75 ^{o} to near vertical angle) gently curving body.*	
B5	*Description*	
B5	*Open bowl with a steep, inwardly sloped (75 ^{o} to near vertical angle) straight-sided body.*	

B6	*Description*	
B6	*Closed bowl with a steep shoulder and globular body leading to a narrow pedestal base. Only one complete example was identified at Tepe Pardis, but it is possible that some ceramics within rim form B1a may represent incomplete examples of this form.*	
Form T	*Description*	
T1	*Tray bowl with a slightly rounded and inwardly flaring rim and thick angular carination in the middle of its body.*	
T2	*Tray bowl with a vertical wall rising to slightly flattened and rounded rim. The base rises to a central piercing, and the exterior of the base is angular. There is a possibility that they are not bowls, but stands.*	
T3	*Open tray bowl with a straight and inwardly sloping body to flat base.*	

Form D	Description	
D1	*Shallow dish with a very shallow inwardly sloped (<45o angle) straight-sided body.*	
Form BE	*Description*	
BE1	*Beaker with a steep and vertical straight shoulder (75 ^{o} to near vertical angle) leading to a Flat-bottomed base.*	
Form R	*Description*	
R1	*Ring-footed base leading to a steep (<45 ^{o} angle) body.*	
R2	*Ring-footed base leading to a shallow (45-60 ^{o} angle) body.*	

R3	*Ring-footed base leading to a slight inward carination and steep (<45 ^{o} angle) body.*	
R4	*Ring-footed base leading to a slight inward carination and shallow (45-60 ^{o} angle) body.*	
Form F	*Description*	
F1	*Flat-bottomed base leading to a steep (<45 ^{o} angle) straight sided body.*	
F2	*Flat-bottomed base leading to a shallow (>45 ^{o}angle) straight sided body.*	
F3	*Flat-bottomed base leading to a shallow (>45 ^{o} angle) inwardly curving body.*	

Tables 5.2, depicts the quantity and percentage of the form types across the assemblages including all the three sites of Sialk, Pardis and Ebrahimabad, Tables 5.3 and 5.4 show the quantity and weight of the form types belonging to the assemblages of the individual sites of Pardis and Sialk, respectively.

Table 5.2 The quantity and percentage of the form types across the assemblages of the Sialk, Pardis and Ebrahimabad.

%	Total	Quantity of EB. II	Quantity of EB. I	Quantity of Pardis II	Quantity of Pardis I	Quantity of Sialk II	Quantity of Sialk I	Vessel types	Type
0.63	13	0	0	8	0	3	2	Jar	J1a
1.25	16	2	0	11	0	0	3	Jar	J1b
2.11	19	0	0	16	3	0	0	Jar	J1c
1.88	24	0	3	10	0	0	11	Jar	J2
1.80	22	4	0	16	0	0	2	Bowl	B1a
1.96	32	0	0	22	0	6	4	Bowl	B1b
1.88	8	3	0	0	0	2	3	Bowl	B1c
0.31	12	0	0	8	0	0	4	Bowl	B1d
3.52	45	6	0	24	0	7	8	Bowl	B1e
1.33	20	6	0	8	0	0	6	Bowl	B2a
2.97	38	7	5	9	3	0	14	Bowl	B2b
3.76	28	9	4	15	0	0	0	Bowl	B2c
9.70	124	12	6	26	0	23	57	Bowl	B3a
16.67	213	17	10	19	4	37	126	Bowl	B3b
4.62	59	11	3	17	2	8	18	Bowl	B3c
10.95	140	5	5	19	0	27	84	Bowl	B3d
0.47	6	0	0	0	0	0	6	Bowl	B3e
1.33	37	0	0	8	0	12	17	Bowl	B4a
3.68	44	0	0	28	0	8	8	Bowl	B4b
6.26	80	3	0	18	0	8	51	Bowl	B5
0.08	1	0	0	1	0	0	0	Bowl	B6
1.17	25	2	0	8	0	8	7	Tray	T1
0.16	2	0	0	2	0	0	0	Tray	T2
0.39	9	0	0	2	0	4	3	Tray	T3
1.17	15	3	0	6	4	2	0	Dish	D1
1.56	20	0	0	4	0	16	0	Beaker	BE1
1.49	19	0	0	19	0	0	0	Base	R1
3.52	45	6	4	26	0	5	4	Base	R2
0.78	10	0	0	4	0	3	3	Base	R3
3.99	51	3	7	34	0	0	7	Base	R4
3.29	42	8	6	11	0	4	13	Base	F1
2.11	27	3	2	0	0	6	16	Base	F2
3.21	41	9	5	8	0	9	10	Base	F3
100.00	1287	Total							

Table 5.3 The quantity and weight of the form types across the assemblages of the Pardis.

Pardis		Type
Weight (gr)	Number	
138	8	J1a
145	11	J1b
314	19	J1c
233	10	J2
524	16	B1a
843	35	B1b
0	0	B1c
231	8	B1d
348	24	B1e
278	8	B2a
388	12	B2b
494	15	B2c
453	26	B3a
425	23	B3b
483	19	B3c
530	19	B3d
0	0	B3e
107	8	B4a
712	28	B4b
514	18	B5
45	1	B6
140	8	T1
52	2	T2
26	2	T3
278	10	D1
34	4	BE1
378	19	R1
832	26	R2
167	4	R3
1036	34	R4
230	11	F1
0	0	F2
157	8	F3
10535	436	

Table 5.4 The quantity and weight of the form types across the assemblages of the Sialk.

Sialk		Type
Weight (gr)	Number	
495	5	J1a
76	3	J1b
0	0	J1c
233	11	J2
46	2	B1a
355	10	B1b
340	5	B1c
95	4	B1d
348	15	B1e
278	6	B2a
943	34	B2b
0	0	B2c
1023	80	B3a
1834	163	B3b
483	26	B3c
1235	111	B3d
140	6	B3e
540	29	B4a
395	16	B4b
514	59	B5
0	0	B6
243	15	T1
0	0	T2
274	7	T3
278	2	D1
540	16	BE1
0	0	R1
340	9	R2
167	6	R3
413	7	R4
549	17	F1
1065	22	F2
456	19	F3
13698	685	

5.3 Phylogenetic analysis of decoration and form of pottery

To test the applicability of the theoretical assumptions embedded in the methodology of biological systematics in the reconstruction of the history of human artefacts, such as pottery, we also applied the cladistic methods of phylogenetic reconstruction to the data set comprising the decoration and form of ceramics from Central Plateau of Iran.

Cladistics is a phylogenetic technique in which analysis focuses on variation in the constituent parts, or “characters (traits),” of a group of taxa by establishing relationships among taxa by identifying characters that are evolutionarily novel from those that were present in the last common ancestor of all the studied taxa (ancestral). The presence of an evolutionarily novel trait (derived) in two or more taxa indicates that they are descended from a common ancestor of more recent origin.

There are several methods to identify which traits are derived and which are ancestral, the most common being the out-group analysis. The out-group shares a common ancestor with the taxa under analysis which is of a more distant origin in comparison with the common ancestor of the analysed taxa. Hence, when a character occurs in two states among the study group, but only one of the states is found in the out-group taxon, the former is considered the derived state and the latter the ancestral state. The next step in a cladistic analysis is to construct a branching diagram or tree (known as cladogram) that connects taxa according to their relative derived status (Tehrani 2011).

It is well known that the common descent is not the only source of similarity among taxa and other processes such as independent evolution and borrowings may be involved, to solve this problem the cladistic method defines a consensus cladogram. The cladogram, based on the principle of parsimony methodology which stated that the explanations should never be made more complicated than necessary, is constructed in a way that is consistent with the largest number characters, hence requiring the smallest number of evolutionary changes to represent the distribution of character states among the taxa. According to this approach the characters that are consistent with the cladogram can be classified either as homologous (i.e. similarities due to common descent) or homoplastic, i.e. the similarities that are due to other processes (Tehrani, 2011). After constructing the most parsimonious tree for the assemblages, the second stage of the analysis examines how well the characters fit the tree. There are two parameters for implement this task. The consistency index (CI) measures the consistency of a tree to a set of data – a measure of the minimum amount of homoplasy implied by the tree and the Retention Index (RI), which can be thought of as the proportion of taxa whose states are not homoplastic (i.e., do not evolve more than once).

As already discussed in Section 4.2.4, we assembled databases on pottery design and form in six groups (taxa): Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II, the first three groups belong to the Sialk I pottery Type of Late Neolithic period and the second three groups belong to the Sialk II pottery Type of Transitional Chalcolithic period. The pottery from the Tepe Chahar Boneh was used as out-group, from the chronological perspective.

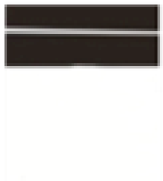
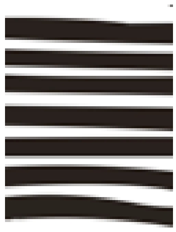
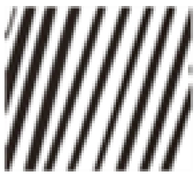
The data set comprised details of decorative characters on 2452 ceramic sherds recovered from Tepe Pardis, Ebrahimabad and Sialk. Every single sherd has been catalogued and photographed. The photographs have been used in the phylogenetic analysis of decoration and form of pottery.

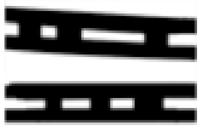
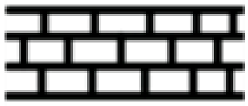
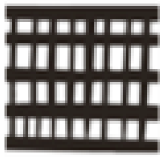
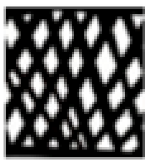
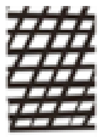
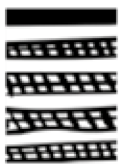
5.3.1 Phylogenetic analyses of pottery decorations

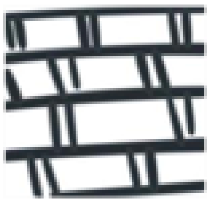
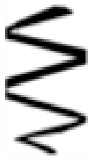
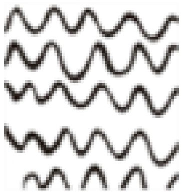
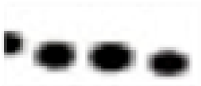
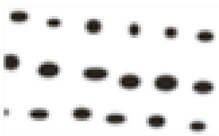
A total of 66 decorative characters (traits) were identified from the pottery of six groups (taxa): Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II.

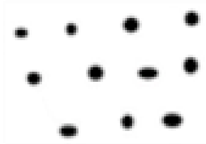
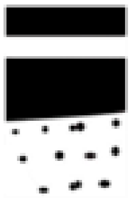
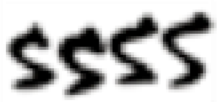
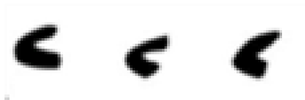
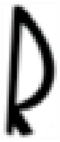
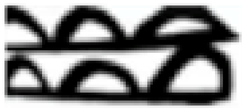
The details of characters are summarised below in Table 5.5.

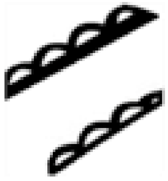
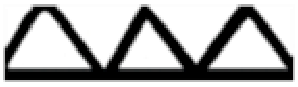
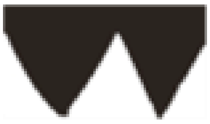
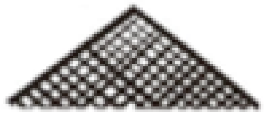
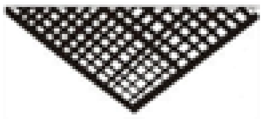
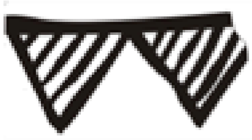
Table 5.5 Decorative characters from the Ebrahimabad, Silak and Pardis with the motif number.

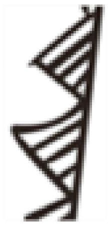
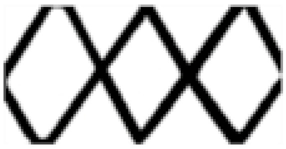
Motifs code	Description	
P.1	Single horizontal line	
P.2	Double horizontal line	
P.3	Horizontal lines	
P.4	Vertical lines	
P.5	Diagonal lines	
P.6	Horizontal row of tree lines, separated with empty space	

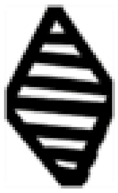
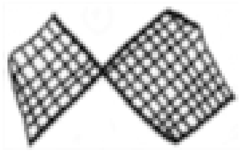
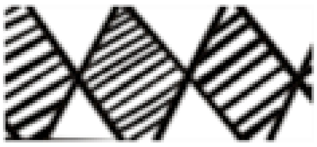
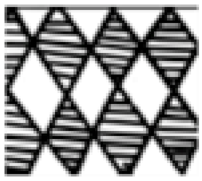
P.7	Double horizontal lines and double Diagonal lines separated with empty space	
P.8	Horizontal ladder	
P.9	Parallel lines with vertical dividers	
P.10	Vertical crosshatching	
P.11	Thick horizontal band with diagonal crosshatching	
P.12	Thick horizontal band with diagonal crosshatching	
P.13	Crosshatched horizontal ladders	

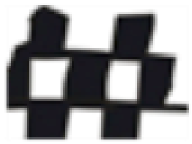
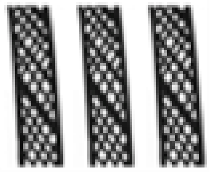
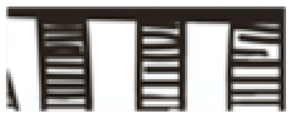
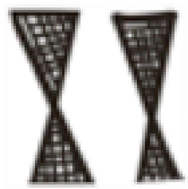
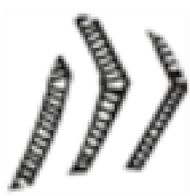
P.14	Parallel lines with double vertical dividers	
P.15	Vertical double parallel zigzags	
P.16	Vertical motif of lines of zigzags	
P.17	Vertical undulating lines	
P.18	Horizontal undulating lines	
P.19	Rows of dots	
P.20	Multiple row of dots	

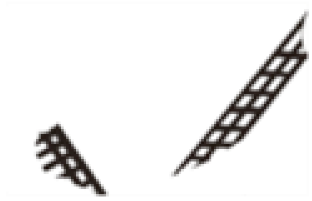
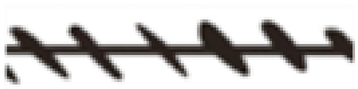
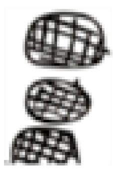
P.21	Multiple dots	
P.22	multiple row of dots under double horizontal lines	
P.23	Horizontal row of floating “S” shaped strokes	
P.24	Row of floating chevrons	
P.25	Vertical festooned lines	
P.26	Horizontal festooned lines	
P.27	Horizontal festooned lines	

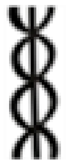
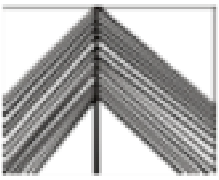
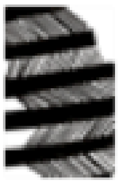
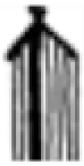
P.28	Diagonal festooned lines	
P.29	Row of Triangles	
P.30	Solid row of pending triangles	
P.31	Diagonally crosshatched triangle	
P.32	Diagonally crosshatched pending triangles	
P.33	Pending triangles filled with diagonal lines	
P.34	Triangles filled with diagonal lines	

P.35	Diagonally crosshatched pending triangles	
P.36	Vertical row of triangles filled with diagonal lines	
P.37	Horizontal nested chevrons	
P.38	Horizontal row of lozenges	
P.39	Horizontal row of lozenges between two horizontal line	
P.40	Diagonal chequer pattern alternating filled with black and white	

P.41	Lozenge filled with horizontal lines	
P.42	Crosshatched lozenges	
P.43	Lozenges filled with diagonal lines	
P.44	Horizontal row of lozenges filled with horizontal lines separated by horizontal line	
P.45	Horizontal row of lozenges filled with horizontal lines	
P.46	Vertical chequer pattern alternating filled with crosshatching	

P.47	Vertical chequer pattern alternating filled with black and white	
P.48	Crosshatched vertical ladders	
P.49	Vertical ladders filled with horizontal lines	
P.50	Diagonal ladders	
P.51	Vertical diagonally crosshatched triangles and pending triangles	
P.52	Horizontal chevrons filled with diagonal lines	

P.53	Vertical parallel zigzags	
P.54	Diagonal crosshatching	
P.55	Crosshatched zigzag ladder	
P.56	Rows of dots alternating with diagonal lines	
P.57	Barbed wire	
P.58	Short vertical strokes	
P.59	Vertical row of crosshatched circulars	

P.60	Vertical row of circulars filled with line	
P.61	Opposed diagonal lines, separated with vertical line	
P.62	Multiple herring bones	
P.63	Herring bone	
P.64	Human?	
P5	Multiple legs pending form?	
P.66	Row of birds?	

After coding, the dataset was subjected to an analysis utilising the phylogenetic software programme PAUP 4. Characters were defined in such a way that they could be scored as either present or absent. The results will be fully discussed in the Chapter Seven.

5.3.2 Phylogenetic analyses of pottery forms

A total of 23 characters in rim forms, as presented in Section 5.2 on typological classification, were selected from the pottery of six groups: Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II. The potteries from the Tepe Chahar Boneh were used as an out-group; from the chronological perspective, the Late Neolithic I phases of the Central Plateau can be characterised with ceramics which were found only at Chahar Boneh.

After coding, the dataset was subjected to an analysis utilising the phylogenetic software programme PAUP 4. Characters were defined in such a way that they could be scored as either present or absent. The results will be fully discussed in Chapter Seven.

5.4 Conclusion

This chapter has presented the results of the analyses of form and decoration of pottery on excavated pottery of the Late Neolithic and Transitional Chalcolithic periods from three prominent prehistoric sites located in Central Plateau of Iran, partly fulfilling Objective three and four of the thesis. The analyses were implemented utilising two methods, namely the typological classification and phylogenetic analysis. In the typological classification, ceramic forms were divided into a number of broad categories: Jars (form J), Bowls (Form B), Beakers (Form BE), Trays (Form T), Bases (Forms F and R) and Dishes (Form D). A total number of 33 different ceramic form categories were identified across the assemblages from Sialk, Pardis and Ebrahimabad and the number, percentage and weight of each form were recorded for all the sites and periods.

In the phylogenetic analysis, the cladistic method of phylogenetic reconstruction was applied to a data set comprising the decoration and form of ceramics from the aforementioned three sites. In the Phylogenetic analyses of pottery decorations, a total of 66 decorative characters (traits) were identified and recorded from the pottery of six groups (taxa): Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II. In the Phylogenetic analyses of pottery forms, a total of 23 characters in rim forms were selected and recorded from the typological classification of the aforementioned six groups.

After coding, the datasets regarding the decoration and forms of pottery both were subjected to an analysis utilising phylogenetic software programme PAUP 4. Characters were defined in such a way that they could be scored as either present or absent.

Chapter 6: the scientific analysis of the selected pottery

6.1 Introduction

Having established the data analyses of form and decoration of the pottery in Chapter Five, Chapter Six will now present the scientific analysis of the pottery, thus fulfilling Objective Five of the thesis. This section of the thesis will focus on the presentation of data collected from scientific techniques for characterising pottery, such as chemical-mineralogical compositions as well as microstructure. This is in order to gain more reliable information concerning the details of development in pottery production techniques for each site and period and highlight their implications for the socio-economic changes occurring in the Central Plateau of Iran in Late Neolithic and Transitional Chalcolithic periods. This also will provide a more precise means for the comparison of the pottery from different sites within the Central Plateau of Iran and serve as a sound basis to clarify the nature of the existing economic and cultural connections and interactions of the prehistoric communities living in this region in the sixth millennium BC.

6.2 Tepe Sialk

As stated above, Tepe Sialk is located in the Central Plateau of Iran, southwest of Kashan and consists of two mounds, North and South, which are approximately 600 metres apart. Sialk, which was the first site in this region to be subjected to systematic archaeological excavation and is one of the most important sites of this region as it exhibits a nearly continuous archaeological sequence from the sixth millennia BC. The North Mound of Tepe Sialk was re-excavated by Fazeli and Coningham, in 2008 and 2009 (Fazeli et al. 2013; Manuel et al. 2014). As the two major types of Sialk's pottery from the North Mound, Sialk I and II, are regionally distributed across the whole Central Plateau of Iran and the prehistoric chronology of the Central Plateau has been based almost entirely on these types of pottery, the investigation of this site has been central to any attempt to define the prehistoric chronology of the Central Plateau of Iran. In this study, the pottery from the North Mound of Sialk was investigated in order to determine their chemical and mineralogical compositions and sample microstructures to bridge the gap in our knowledge regarding the technical aspects of the pottery making and its development at Sialk.

6.2.1 Sample selection

A total of 36 painted pottery sherd samples were selected from the absolute dated contexts excavated at the North mound of Sialk. The sherds comprised two different collections of Sialk type pottery, including 22 painted sherds from Sialk I and 14 painted sherds from Sialk II. The samples of each collection were randomly selected from the two groups of excavated pottery on the basis of their appearance, that is, colour and decoration. Sialk I pottery sherds were selected from the excavated buff pottery group, decorated with black painted simple geometric motifs, while the Sialk II pottery sherds from the red pottery group decorated with black painted simple or composite geometric motifs. Details of Sialk's stratigraphic sequence and the absolute chronology of the excavated two trenches, are shown in Tables 6.1 and 6.2 and details of the analyses carried out on the samples and results will be discussed below.

6.2.2 Chemical composition

The collection of 36 sherds from Sialk were all analysed by X-ray fluorescence (XRF). The chemical composition of the Sialk I and II specimens can be seen in Table 6.3 and 6.4, respectively. From Table 6.1, it can be inferred that Sialk I specimens exhibit quite similar compositions, although CaO shows a relatively high value of standard deviation. This deviation is quite common and can be attributed to the variation of content in the original clay deposits. It has been shown that of six elemental oxides, the greatest variation within a single clay deposit occurs with CaO (Buko 1984) and a variety of processes in the burial environment may also alter the chemical composition of pottery. Two of these processes are cation leaching (Bieber et al. 1976) and exchange (Hedges & McLellan 1976) and calcium is one of the elements that is susceptible to all of the above-mentioned processes. Leaching and ion-exchange processes may also affect the alkali elements such as sodium and potassium, whereas silicon, aluminium and iron are more resistant to these processes. On the basis of these results, it may be deduced that the Sialk I pottery studied was manufactured using a single resource of clay raw material or clay from very similar resources and the relatively high content of CaO in most specimens indicates the use of calcareous clays as the source of raw material to make most of this pottery. On the other hand, the chemical composition of the Sialk II type specimens (Table 6.4) indicated the existence of two different types of pottery, namely calcium rich and relatively poor in calcium. Each group exhibiting quite homogeneous compositions. The group one specimens (calcium rich), which have almost similar compositions to the Sialk I specimens, apparently have been made using the same clay raw materials as the Sialk I pottery. These vessels are distinguished by the strong red colour of their surface and buff colour of the core. The specimens of the second group, which were red both on the core and on the surface, are the product of different raw materials. The unusually high concentration of P_2O_5 in some sherds indicates that those vessels have probably been used as containers for some organic materials, such as foods, especially in liquid form.

The Principal Component Analysis (PCA) plot carried out on the XRF chemical composition data of Sialk I and II pottery samples is depicted in Figure 6.1. From the figure it can be deduced that a group of pottery samples comprising the Sialk I, as well as Ca-rich samples of the Sialk II period exhibited considerable clustering of the pottery compositions, whereas, the Ca-poor samples of the Sialk II period showed discreet clustering which was effectively separated from the first group of samples. These results were in conformity with the above discussion concerning the homogeneity of the chemical compositions within both of Sialk I and II pottery groups and the similarity of compositions between the Sialk I pottery and Ca-rich pottery of Sialk II, which significantly differs from those of the Ca-poor pottery of Sialk II.

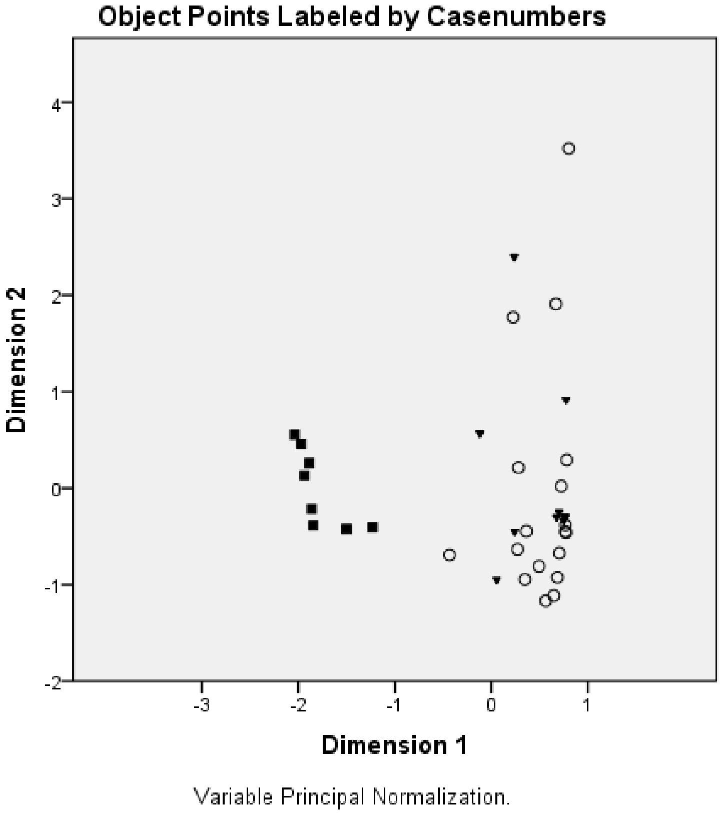


Figure 6.1 PCA of Sialk I and II Ware samples. The site abbreviations are as follows; ■ Ca-poor Sialk II samples (n = 8), ▼ Ca-rich Sialk II samples (n = 6), O Sialk I samples (n = 22).

6.2.3 Mineralogical analysis

A total of 20 of the 36 samples from Sialk were selected randomly and were analysed by powder X-ray diffraction technique (XRD). They included 10 sherds from Sialk I and II each. Figure 6.2 depicts the PXRD traces of some typical Sialk I and II samples from Sialk and Table 6.5 summarises the mineralogical analyses of them (see Appendix D for full traces). As shown in the Table 6.3, besides the signs of the presence of $CaCO_3$ in some specimens especially the older specimens, Quartz and Esseneite (Calcium Iron Aluminum Silicate, Ca $(Fe_{1.4} Al O_{0.6})SiO_6$, were the major crystalline phases of Sialk I and calcium rich Sialk II specimens. In comparison, the low calcium Sialk II specimens were mainly composed of Quartz, Hematite and Augite (Calcium Aluminum Iron Magnesium Silicate), Ca (Mg,Al,Fe)Si_2O_6 phases. Moreover, the faint trace of Illite phase observed in some specimens, which is more pronounced in older specimens of Sialk I pottery sherds (e.g. specimen S1z), indicates that the raw materials used in the production of this pottery, with the exception of the low calcium Sialk II pottery, was possibly Illite clay.

6.2.4 Microstructural Examinations

Figures 6.3-6.8 and 6.9-6.15 show the SEM micrographs of Sialk I and II pottery, respectively (see Appendix C for full SEM micrographs). The relatively uniform microstructures of all the samples, and the absence of large and angular particles, indicate that the raw materials used in making these ceramics was most probably sedimentary (secondary) clay. They also indicate that no inorganic tempers have deliberately been added to the starting clays. However, the traces of plant tempers, such as fine chaff or dung, can be seen on the cross-sections of some pottery sherds (Figures 6.3, 6.4, 6.13). There are also some sporadic large rounded particles present in some microstructures, which are mainly Quartz (Figure 6.7). These are the remnants of occasional large Quartz particles, occurring naturally in the initial raw materials.

SEM studies show that Sialk I and II pottery, as well as the two different types of Sialk II red pottery - calcium rich and poor in calcium (see Tables 6.3 and 6.4) which have different phase compositions as discussed above, also exhibit considerable differences in their microstructures. A marked differences in density, degree of vitrification and porosity were observed between the earlier Sialk I and later Sialk II pottery; While, no difference were observed between the microstructure of various specimens of the older phase of Late Neolithic pottery, a considerable difference existed between the earlier and later phases of the Late Neolithic pottery specimens.

Figures 6.14 and 6.15, which depict the SEM microstructures and the surface elemental map of two Sialk II pottery sherds, indicate that the red surface of both samples contained pigments rich in iron oxide. Referencing the mineral compositions shown on Table 6.5, the aforementioned sherds possessed similar phases as sherds of Sialk I pottery, namely Quartz and Esseneite and no iron oxide (Fe_2O_3), which is responsible for the red colour of pottery. Hence, it can be deduced that a fine red slip is possibly present on the exterior and interior surfaces of the latter Sialk II sherds, which due to its very low thickness, has not produced visible effects in the XRD analysis.

It is interesting to note that there are also a few Sialk I sherds also covered with a red coating, the last four samples of Table 6.3. The elemental map of one of these specimens (sample S1ab) illustrated in Figure 6.8, shows the presence of high iron amounts on its surface.

Figures 6.16 and 6.17 depict the typical elemental spectra of some Sialk II samples. It can be seen that the sample S2c having a red coating on its exterior and interior surfaces exhibits a relatively large difference in iron content between its surface and core (Figure 6.16 a and b). The other sample, sample S2p, which is red both on the surface and core represents a much smaller difference in iron content (Figure 6.17 a and b). This confirms our deduction regarding the application of an iron rich slip to the surface of some specimens.

It was also demonstrated that the difference observed between the content of iron on the exterior surface and the core of the specimens, as determined by SEM elemental map of different sections, was extendable to other pottery sherds as well (Table 6.6). Therefore, the difference between the content of iron on the exterior surface and the core of the specimens can be noted as a good criterion to show the existence or absence of a red coating on the surface of the pottery.

Table 6.1 C14 dated sequences of the selected Sialk I pottery samples.

Pottery ID	Context	Trench	Period		Calibrated date with 95% probability (BC)
S1z	6042	VI	I1	Late Neolithic (Early)	5775-5642
S1y	6036	VI	I1	Late Neolithic (Early)	5764-5642
S1v	6035	VI	I2	Late Neolithic (Early)	5894-5725
S1h	6035	VI	I2	Late Neolithic (Early)	5894-5725
S1q	6035	VI	I2	Late Neolithic (Early)	5894-5725
S1ae	6035	VI	I2	Late Neolithic (Early)	5894-5725
S1aa	6033	VI	I2	Late Neolithic (Early)	5894-5725
S1g	6032	VI	I3	Late Neolithic (Early)	5894-5725
S1f	6018	VI	I3	Late Neolithic (Early)	5325-5207
S1j	6018	VI	I3	Late Neolithic (Early)	5325-5207
S1r	6018	VI	I3	Late Neolithic (Early)	5325-5207
S1d	6016	VI	I3	Late Neolithic (Early)	5325-5207
S1o	6013	VI	I4	Late Neolithic (Late)	5465-5442
S1m	6013	VI	I4	Late Neolithic (Late)	5465-5442
S1ab	6009	VI	I4	Late Neolithic (Late)	5465-5442

S1e	5117	V	I4	Late Neolithic (Late)	5211-5003
S1ad	5119	V	I4	Late Neolithic (Late)	5211-5003
S1ac	5105	V	I5	Late Neolithic (Late)	5282-5275
S1a	5095	V	I5	Late Neolithic (Late)	5314-5205
S1l	5095	V	I5	Late Neolithic (Late)	5314-5205
S1b	5095	V	I5	Late Neolithic (Late)	5314-5205
S1c	5095	V	I5	Late Neolithic (Late)	5314-5205

Table 6.2 C14 dated sequences of the selected Sialk II pottery samples.

Pottery ID	Context	Trench	Period		Calibrated date with 95% probability (BC)
S2c	5097	V	II1	Transitional Chalcolithic (Early)	5316-5206
S2e	5089	V	II1	Transitional Chalcolithic (Early)	5316-5206
S2n	5088	V	II1	Transitional Chalcolithic (Early)	5316-5206
S2p	5026	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2b	5023	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2j	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2f	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2a	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2g	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2i	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2d	5021	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2h		V	II2	Transitional Chalcolithic (Early)	

S2m	5017	V	II2	Transitional Chalcolithic (Early)	4982-4973
S2k	5017	V	II2	Transitional Chalcolithic (Early)	4982-4973

Table 6.3 Chemical composition the selected Sialk I pottery samples (wt%)

Oxide/ Sample	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	Fe_2O_3
S1y	0.75	2.3	9.75	44.6	0.16	3.54	19.21	1.29	16.36
S1z	0.59	2.62	10.94	45.18	0.45	2.34	17.33	1.38	17.56
S1v	0.44	2.83	10.02	43.21	0.32	2.08	23.4	1.26	15.33
S1h	0.32	2.4	9.82	47.75	0.18	3.51	18.89	1.28	14.24
S1q	0	1.87	9.53	47.53	0.25	4.23	18.75	1.25	14.63
S1ae	0.27	2.27	10.33	47.08	0.22	2.42	19.93	1.21	15.03
S1aa	0.33	2.49	10.7	48.09	0.22	4.14	16.87	1.23	14.42
S1g	0.73	1.89	10.16	47.64	0.25	2.51	20.8	1.27	13.69
S1f	0.21	1.99	8.59	43.68	0.5	4.23	25.3	1.2	12.62
S1j	0.58	2.48	9.09	44.09	0.51	3.88	22.6	1.17	13.93
S1d	0	2.2	9.25	45.7	0.36	3.68	22.68	1.21	13.41
S1o	0.18	2.18	8.71	42.11	0.47	3.75	26.79	1.19	13.23
S1m	0.15	2.34	9.09	42.9	0.24	3.32	26.14	1.15	13.46
S1e	0.37	2.42	9.06	43.28	0.4	3.24	24.61	1.12	14.11
S1a	0.32	1.97	9.37	45.12	0.3	3.72	22.72	1.2	13.98
S1l	0.13	1.39	8.33	44.49	0.3	3.51	24.11	1.19	14.85
S1b	0.42	2.3	9.71	44.86	0.25	3.72	22.4	1.18	14.03
S1c	0.69	2.25	9.88	45.96	0.28	4.04	20.33	1.18	14.34
S1ab	0.44	2.26	9.45	46.2	0.73	4.04	20.46	1.2	14.02
S1ac	0.31	2.26	9.2	43.87	0.6	3.51	22.6	1.2	14.97
S1r	0	2.07	8.15	40.37	1.38	3.55	29.32	1.18	12.13
S1ad	0.39	2.37	9.19	43.93	0.66	1.96	25.6	1.12	13.7
Average	0.35	2.23	9.47	44.89	0.41	3.41	22.31	1.21	14.27
SD	0.23	0.30	0.71	1.99	0.27	0.70	3.22	0.06	1.17

Table 6.4 Chemical composition of the selected Sialk II pottery samples (wt%).

Oxide/ Sample	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	Fe_2O_3
S2m	0.52	2.28	10.15	46.24	0.27	4.26	18.88	1.19	15.01
S2b	0.56	2.42	8.51	50.41	0.26	4.72	17.88	1.19	12.88
S2e	0.69	2.35	9.37	44.02	0.23	4.13	22.59	1.2	14.07
S2c	0.59	2.4	10.09	49.13	0.26	4.7	15.3	1.18	15.07
S2n	0.21	2.13	8.96	42.27	1.23	3.56	24.56	1.24	13.92
S2f	0.33	2.11	8.81	41.05	0.28	4.49	27.28	1.17	13.2
Average	0.48	2.28	9.32	43.85	0.42	4.31	22.75	1.20	14.03
SD	0.18	0.13	0.68	3.34	0.40	0.44	4.91	0.02	0.90
Oxide/ Sample	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**P_2O_5**	**K_2O**	**CaO**	**TiO_2**	**Fe_2O_3**
S2a	0.69	1.46	10.67	62.35	0.22	5.15	3.67	1.42	13.56
S2i	0.34	1.56	10.78	58.67	0.2	5.5	8	1.47	12.54
S2p	0	1.54	11.02	57.4	0.22	5.15	2.88	1.41	18.97
S2k	0.35	1.45	12.19	60.17	0.24	4.77	2.53	1.44	15.95
S2d	0.36	1.75	11.06	59.75	0.26	5.42	6.17	1.43	12.93
S2h	0.42	1.62	10.33	59.86	0.34	4.72	4.73	1.49	14.91
S2g	0.36	1.53	11.66	60.52	0.16	4.42	3.13	1.47	15.88
S2j	0.78	1.43	11.7	54.07	0.29	4.43	8.35	1.61	16.3
Average	0.36	1.56	11.10	59.82	0.23	5.02	4.44	1.45	14.96
SD	0.20	0.10	0.63	1.54	0.06	0.40	2.01	0.03	2.23

Table 6.5 Mineralogical composition of the selected pottery samples

Pottery ID	Site	Type	Surface colour	Colour of core	Major phases (JCPDS card No.)
S1f	Sialk	Sialk I	Buff	Buff	Esseneite (25-0143), Quartz (01-0649)
S1r	Sialk	Sialk I	Buff	Buff	Esseneite (25-0143), Quartz (01-0649)

S2m	Sialk	Sialk II	Red	Buff	Esseneite (25-0143), Quartz (01-0649)
S2n	Sialk	Sialk II	Red	Buff	Esseneite (25-0143), Quartz (01-0649)
S2e	Sialk	Sialk II	Red	Buff	Esseneite (25-0143), Quartz (01-0649)
S2i	Sialk	Sialk II	Red	Red	Augite (24-0202), Quartz (01-0649), Hematite (01-1053)
S2h	Sialk	Sialk II	Red	Red	Augite (24-0202), Quartz (01-0649), Hematite (01-1053)

Table 6.6 Difference in content of iron between exterior surface and core in the selected Sialk pottery samples

Pottery ID	Type of pottery	Surface colour	Core colour	With red coating	Without coating	Fe2O3 content of surface and core respectively (wt %)*	Context
S2m	Sialk II	Red	Buff	*		20.28, 5.92	5017
S1ab	Sialk I	Red	Buff	*		21.41,4.18	6009
S2e	Sialk II	Red	Buff	*		23.56, 5.23	5089
S2c	Sialk II	Red	Buff	*		20.71, 4.59	5097
S2f	Sialk II	Red	Buff	*		12.34, 7.94	5021
S1t	Sialk I	Red	Buff	*		11.32, 5.04	6033
S1w	Sialk I	Red	Buff	*		27.4I, 6.11	6033
S2g	Sialk II	Red	Buff	*		15.88, 4.93	5021
S2a	Sialk II	Red	Buff	*		12.23, 4.32	5021
S2p	Sialk II	Red	Red		*	4.57, 5.52	5026
S2k	Sialk II	Red	Red		*	6.27, 5.02	5017
S2d	Sialk II	Red	Red		*	3.52, 4.14	5021
S2i	Sialk II	Red	Red		*	3.05, 3.73	5021
S2b	Sialk II	Red	Red		*	6.12, 3.91	5023

*Average values of 10 measurements.

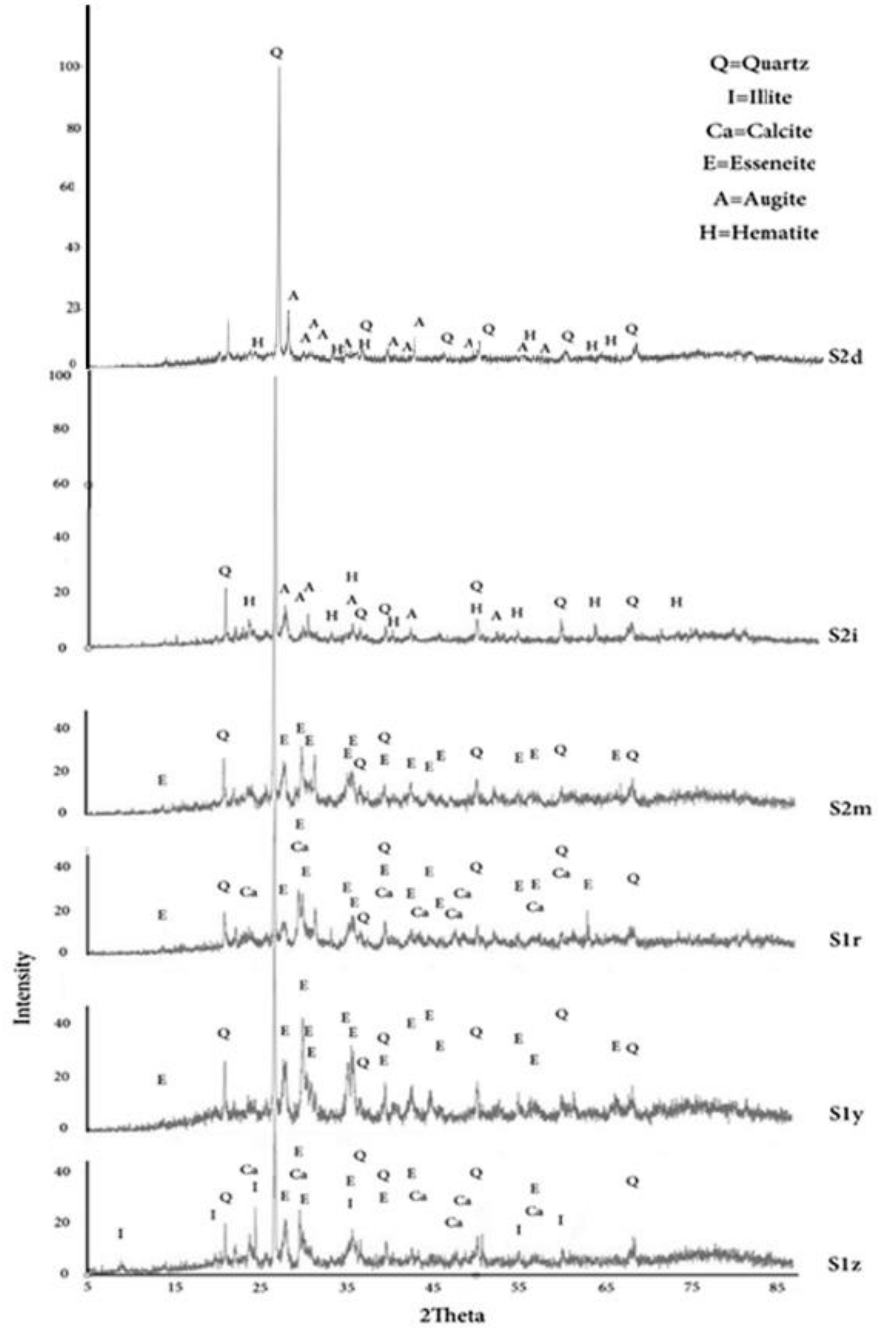


Figure 6.2 XRD traces of some typical Sialk I and II pottery specimens.

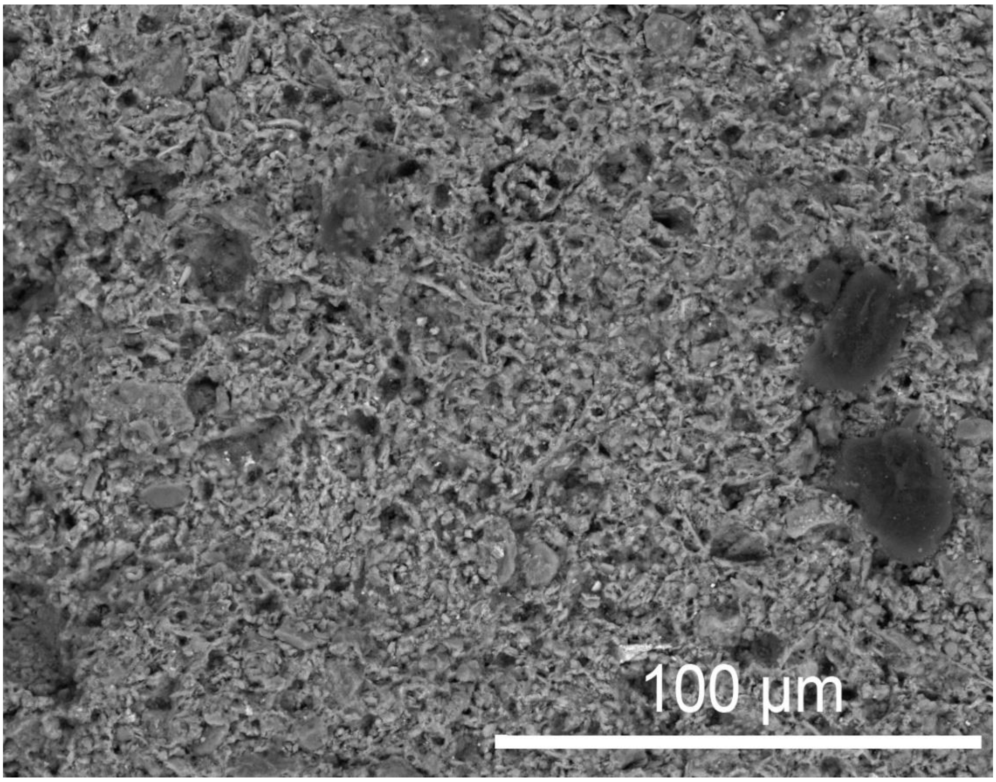


Figure 6.3 SEM microstructure of the Sample S1h depicting the added organic temper to the pottery.

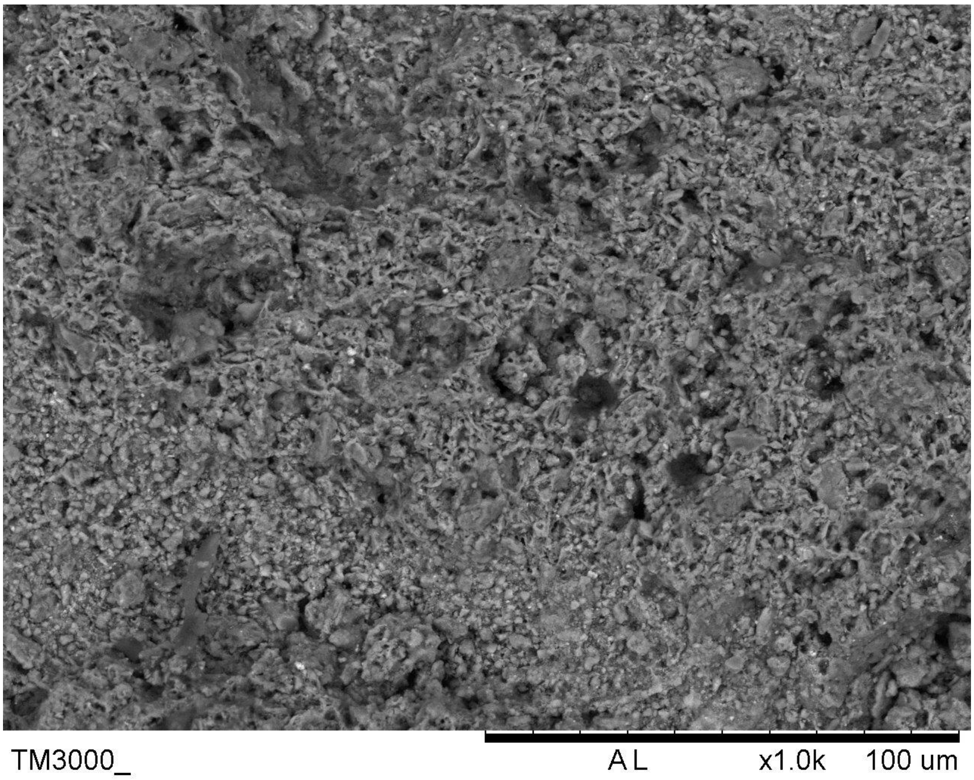


Figure 6.4 SEM micrograph of the Sample S1ae depicting the added organic temper to the pottery.

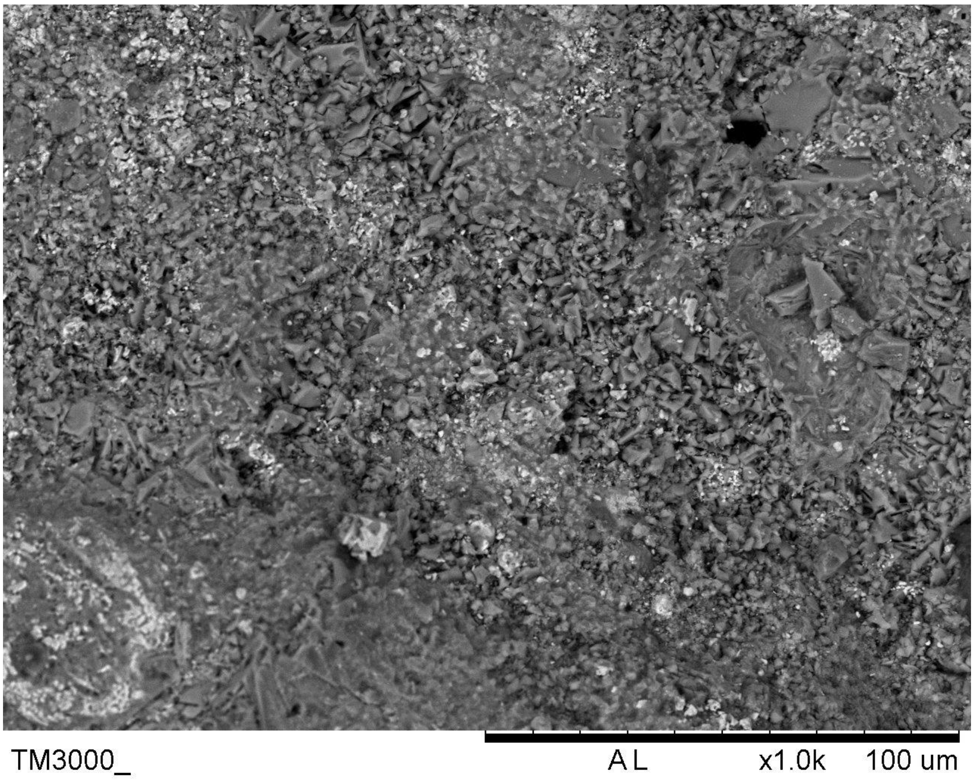


Figure 6.5 SEM micrograph of the Sample S1m.

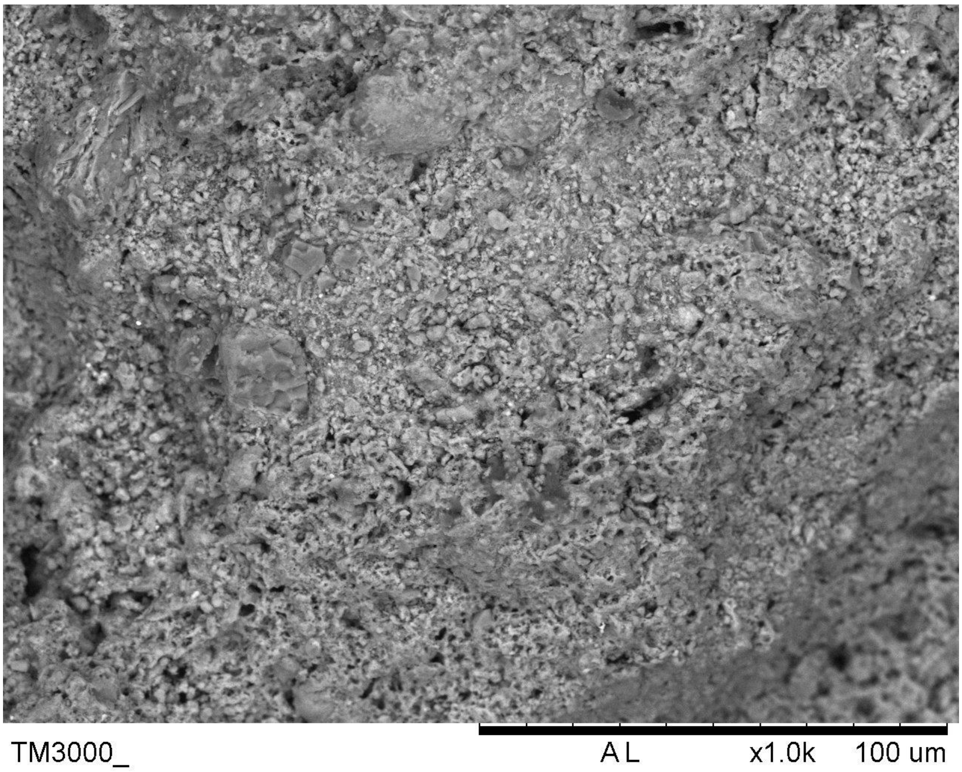


Figure 6.6 SEM micrograph of the Sample S1c.

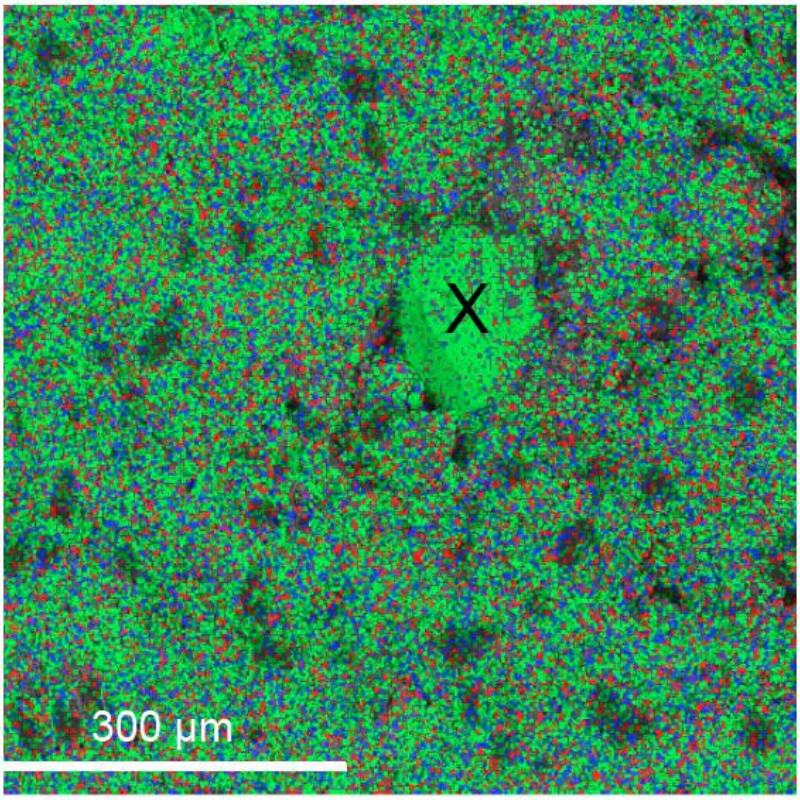
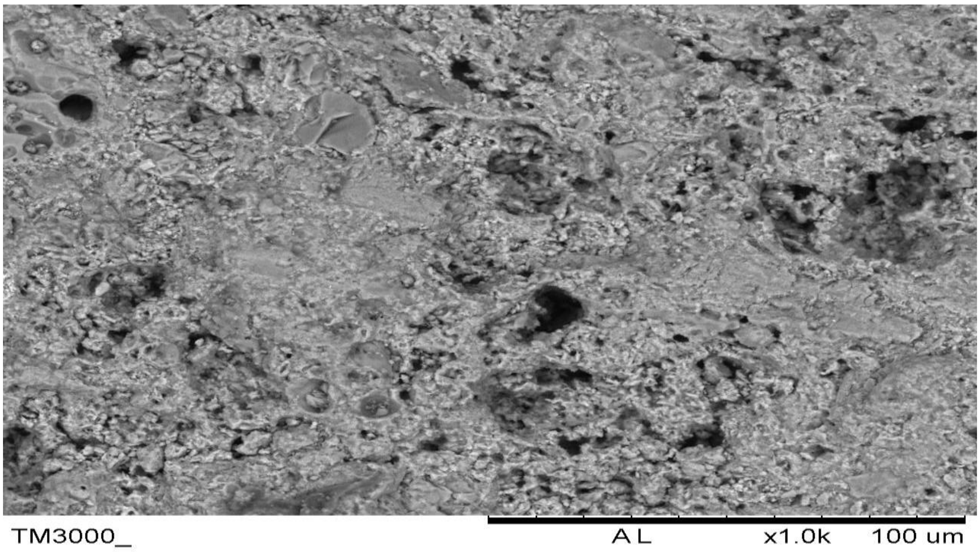
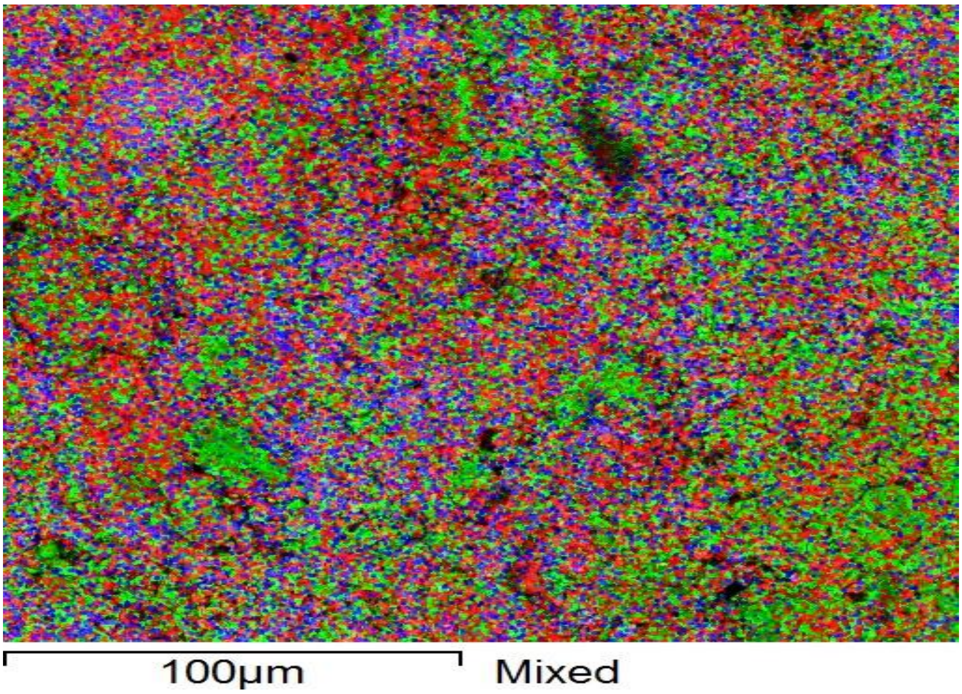


Figure 6.7 SEM microstructure of a Sialk I specimen. The particle marked by x is Quartz. Mixed map: Calcium (red), silicon (green), aluminium (blue).



(a)



Summary results

Element	Weight %	Weight % σ	Atomic %
Oxygen	42.276	0.377	64.278
Sodium	1.168	0.089	1.236
Magnesium	2.297	0.083	2.298
Aluminum	3.620	0.087	3.264
Silicon	11.677	0.138	10.114
Phosphorus	0.397	0.059	0.311
Sulfur	0.893	0.057	0.677
Chlorine	0.216	0.050	0.148
Potassium	2.410	0.075	1.499
Calcium	5.123	0.100	3.109
Titanium	0.257	0.068	0.130
Manganese	1.773	0.126	0.785

Iron	27.894	0.298	12.150

(b)

Figure 6.8 (a) SEM microstructure (core) and (b) an elemental map showing the surface of S1ab specimen covered with a red coating rich in iron oxide. Mixed map: Calcium (red), Silicon (green), Iron (blue).

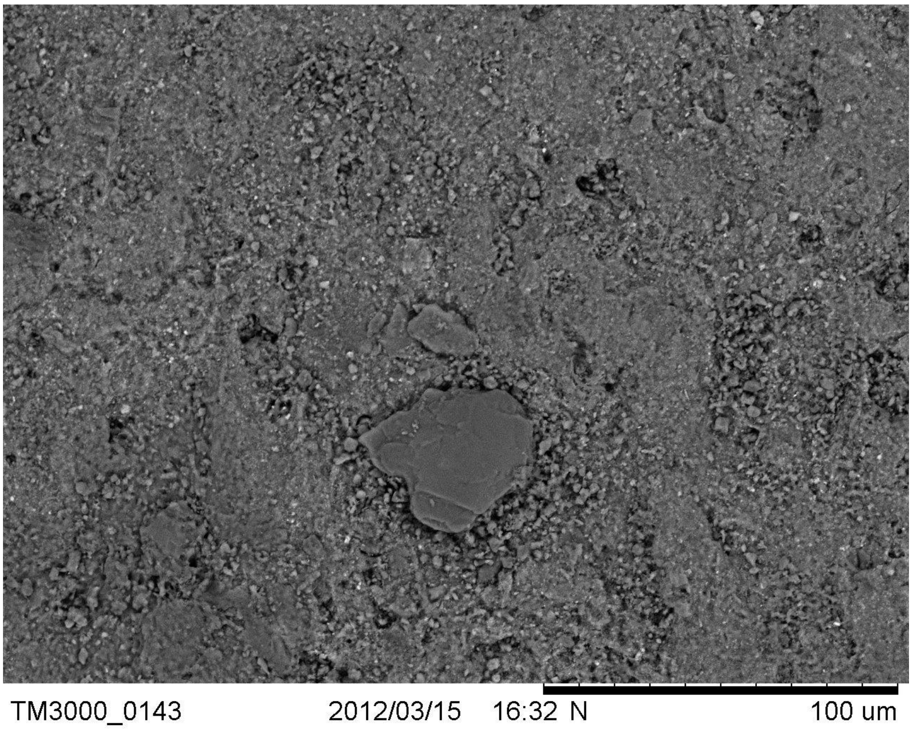


Figure 6.9 SEM micrograph of Sample S2a, exterior surface.

Figure 6.10 SEM microstructure of Sample S2e, exterior surface.

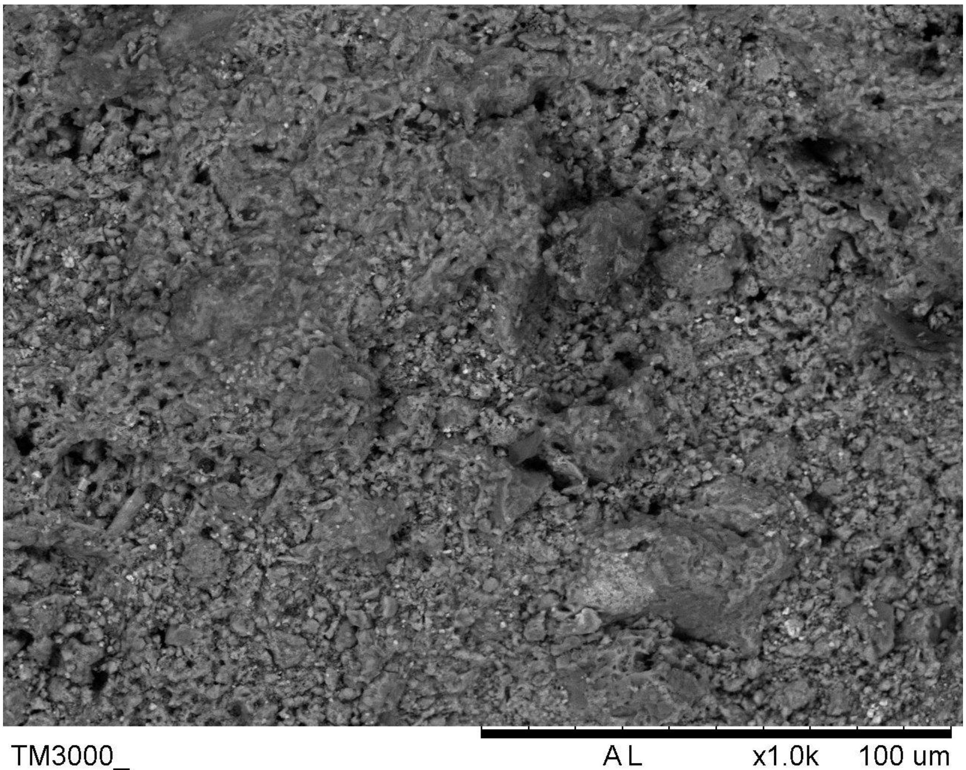


Figure 6.11 SEM microstructure of a red coated Sample S2n, core.

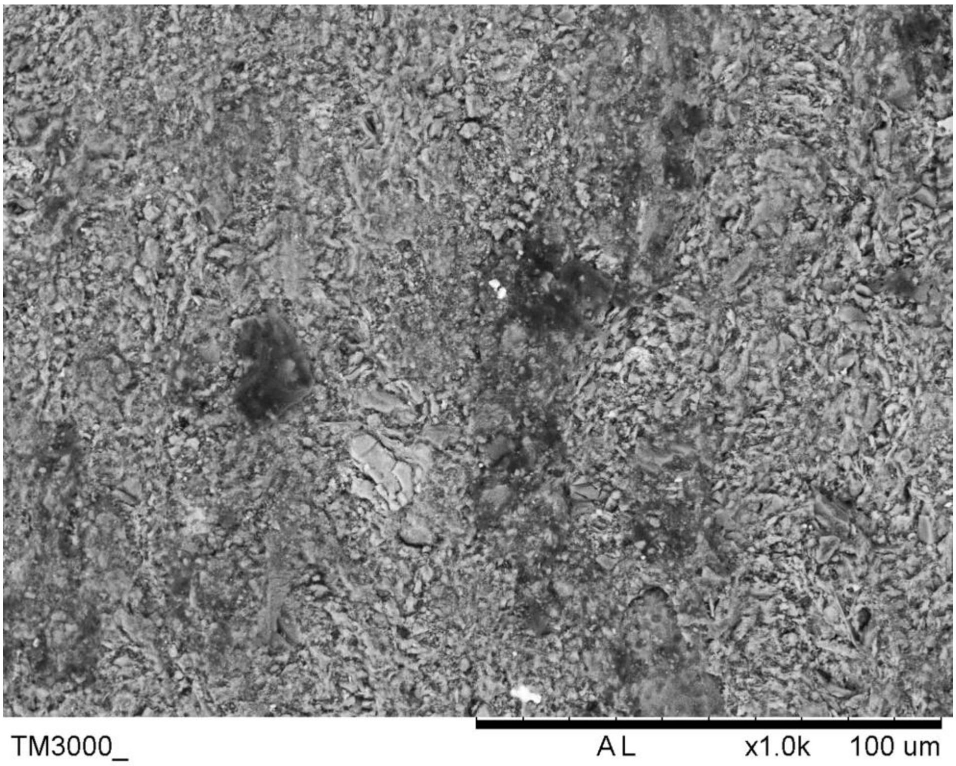
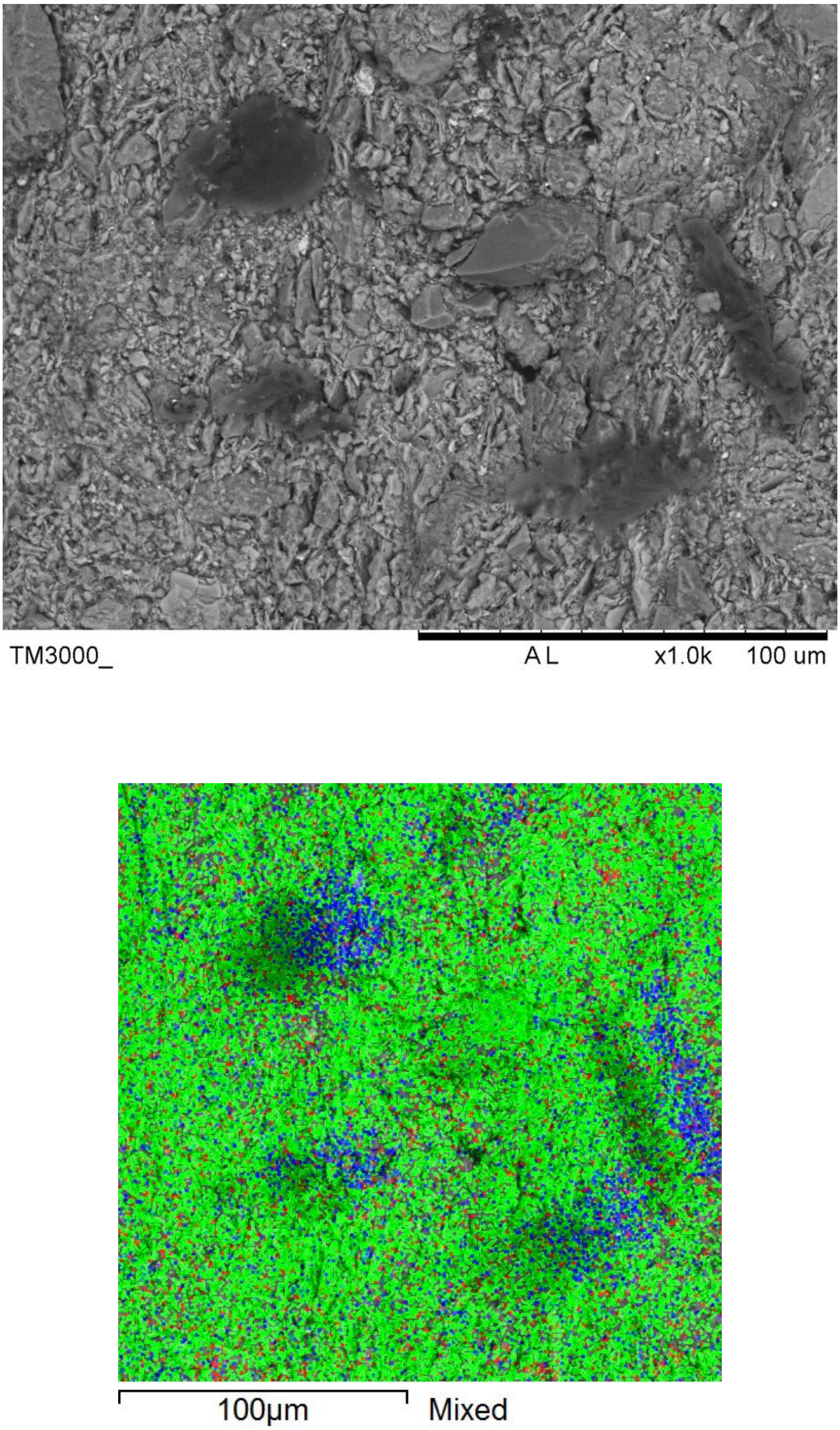


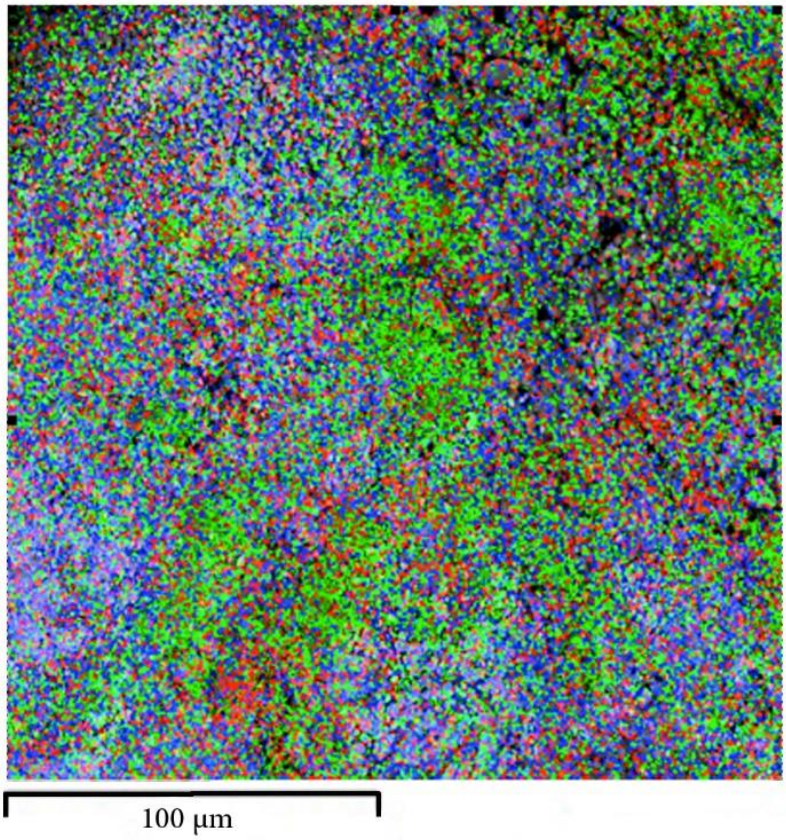
Figure 6.12 SEM microstructure of Sample S2p core.



(a)

(b)

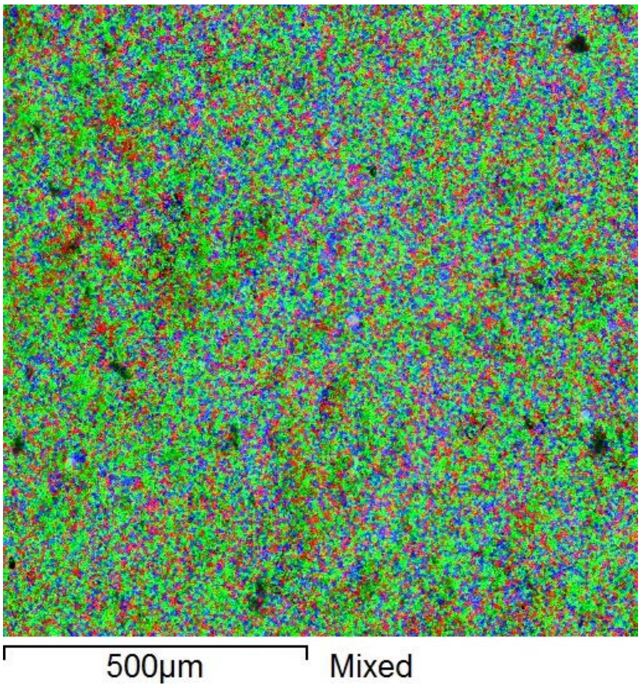
Figure 6.13 (a) SEM microstructure of Sample S2k core. (b) Mixed map: Calcium Ka1 (red), Silicon Ka1 (green), Carbon Ka1_2(blue).



Summary results

Element	Weight %	Weight % σ	Atomic %
Sodium	1.312	0.099	1.479
Magnesium	2.587	0.092	2.757
Aluminum	4.087	0.096	3.923
Silicon	13.199	0.144	12.173
Phosphorus	0.452	0.068	0.378
Sulfur	1.011	0.065	0.817
Chlorine	0.243	0.057	0.178
Potassium	2.699	0.083	1.788
Calcium	5.730	0.109	3.703
Titanium	0.286	0.076	0.155
Manganese	1.973	0.140	0.930
Iron	31.004	0.291	14.380
Oxygen	35.416	0.274	57.339

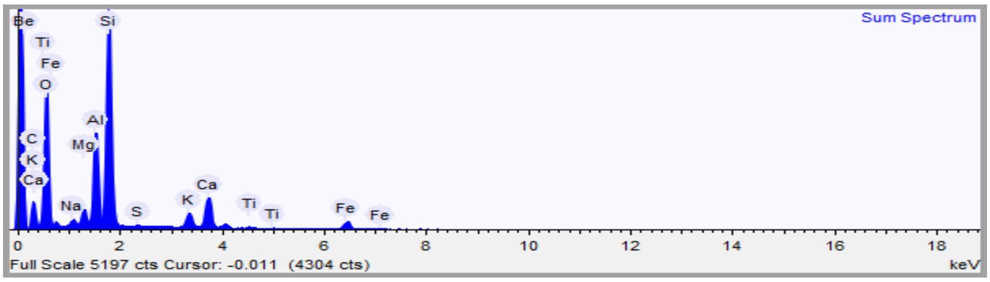
Figure 6.14 SEM microstructure and an elemental map showing the surface of S2m specimen covered with a red coating rich in iron oxide. Mixed map: Calcium (red), Silicon (green), Iron (blue)



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	1.375	1.490	2.634
Oxygen	45.406	0.738	65.303
Sodium	0.701	0.062	0.702
Magnesium	2.401	0.072	2.272
Aluminum	3.695	0.086	3.151
Silicon	13.512	0.232	11.070
Sulfur	0.804	0.045	0.577
Potassium	1.356	0.053	0.798
Calcium	4.980	0.106	2.859
Titanium	0.209	0.051	0.100
Manganese	0.420	0.074	0.176
Iron	25.142	0.436	10.359

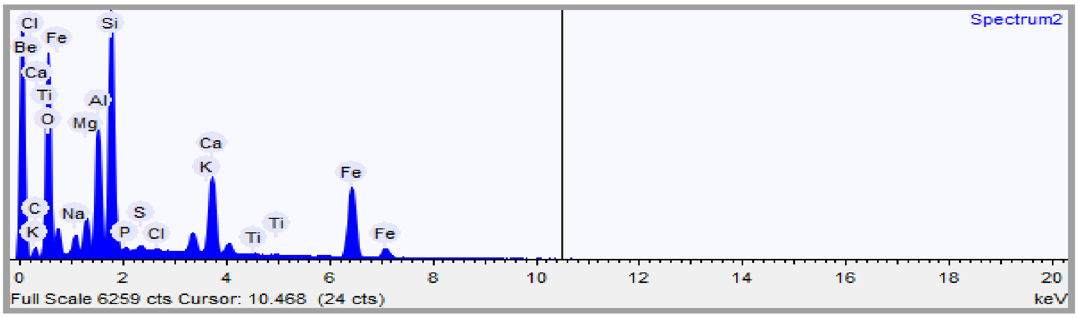
Figure 6.15 SEM microstructure and an elemental map showing the surface of S2e specimen covered with a red coating rich in iron oxide. Mixed map: Calcium (red), Silicon (green), Iron (blue).



Summary results

Element	Weight %	Weight %	Atomic %	Compound %	Formula
Carbon	7.975	2.211	12.857	29.220	CO_2
Sodium	0.958	0.080	0.807	1.291	Na_2O
Magnesium	2.403	0.130	1.914	3.985	MgO
Aluminum	5.116	0.247	3.671	9.666	Al_2O_3
Silicon	16.133	0.745	11.123	34.512	SiO_2
Sulfur	0.324	0.045	0.196	0.809	SO_3
Chlorine	0.140	0.043	0.076	0.000	
Potassium	1.976	0.111	0.979	2.381	K_2O
Calcium	8.093	0.383	3.910	11.324	CaO
Titanium	0.312	0.062	0.126	0.521	TiO_2
Iron	4.782	0.268	1.658	6.152	FeO
Oxygen	51.788	2.249	62.682		

(a)

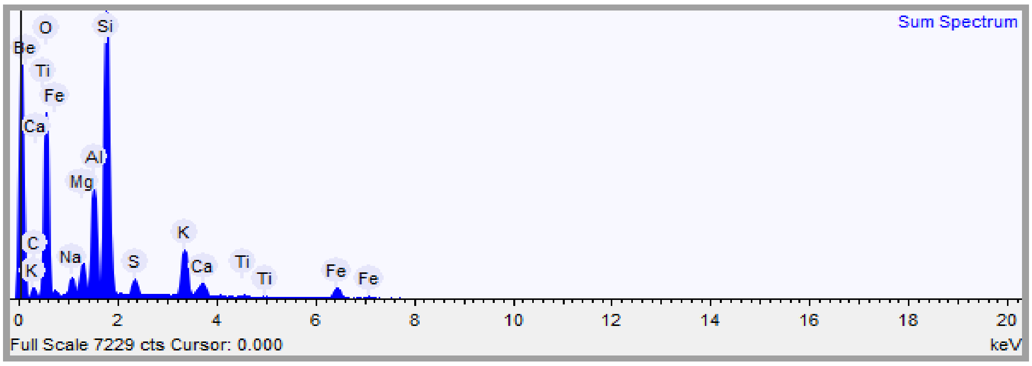


Summary results

Element	Weight %	Weight % σ	Atomic %	Compound %	Formula
Carbon	0.000	0.000	0.000	0.000	CO2
Sodium	1.728	0.074	1.849	2.330	Na2O
Magnesium	2.553	0.068	2.583	4.233	MgO
Aluminum	7.483	0.087	6.823	14.138	Al2O3
Silicon	15.036	0.114	13.170	32.166	SiO2
Phosphorus	0.254	0.050	0.202	0.583	P2O5
Sulfur	0.347	0.045	0.266	0.866	SO3
Chlorine	0.170	0.044	0.118	0.000	
Potassium	1.794	0.058	1.129	2.161	K2O
Calcium	7.904	0.092	4.851	11.059	CaO
Titanium	0.226	0.058	0.116	0.377	TiO2
Iron	24.810	0.207	10.929	31.918	FeO
Oxygen	37.695	0.198	57.963		

(b)

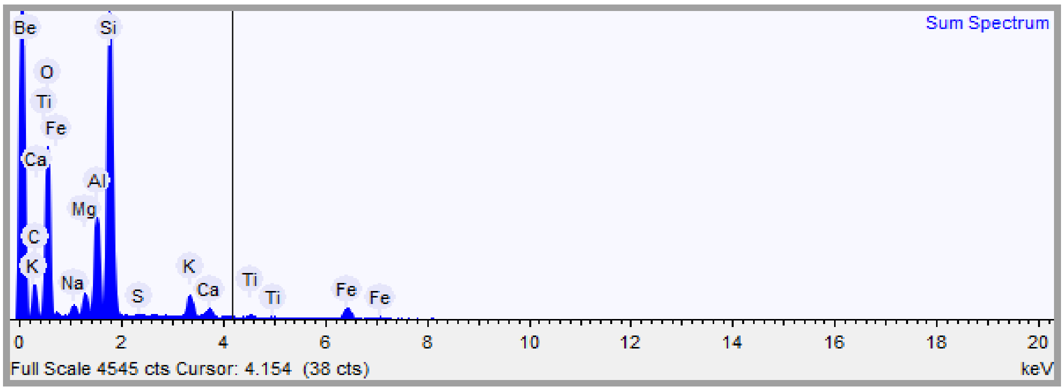
Figure 6.16 A typical elemental spectrum of the Sample S2c with a red coating. (a) Core. (b) Exterior surface.



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	0.000	0.000	0.000
Oxygen	51.348	0.287	66.863
Sodium	1.846	0.075	1.673
Magnesium	2.426	0.071	2.079
Aluminum	7.463	0.098	5.762
Silicon	22.177	0.169	16.450
Sulfur	1.621	0.061	1.054
Potassium	6.027	0.094	3.211
Calcium	1.648	0.068	0.856
Titanium	0.336	0.060	0.146
Iron	5.109	0.152	1.906

(a)



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	12.957	2.805	20.115
Oxygen	47.914	1.587	55.841
Sodium	1.020	0.083	0.828
Magnesium	1.507	0.087	1.156
Aluminum	6.276	0.230	4.337
Silicon	21.335	0.717	14.164
Sulfur	0.190	0.050	0.111
Potassium	2.397	0.113	1.143
Calcium	1.079	0.079	0.502
Titanium	0.501	0.077	0.195
Iron	4.823	0.245	1.610

(b)

Figure 6.17 A typical elemental spectrum of the Sample S2p which is in red colour both on exterior and core. (a) Exterior surface. (b) Core.

6.3 Tepe Ebrahimabad

As discussed above, Tepe Ebrahimabad is located on the Qazvin Plain within the Central Plateau of Iran. Following initial analysis of the pottery from this site during excavations in 2006 (Fazeli et al. 2009), the existence of two main cultural periods at the site, Late Neolithic and Transitional Chalcolithic, was proposed. The aforementioned archaeological periods were mainly characterised by the presence of two types of pottery, namely Sialk I type buff painted pottery decorated with black painted simple geometric motifs, and Sialk II Ware characterised by the thin hand-made red pottery, typically decorated with black painted motifs that include simple or composite geometric designs. The present study will attempt to explore the potential of scientific analyses and microstructural studies in characterising the sherds found at Ebrahimabad. This will better assist the understanding of the development of pottery-making on the Qazvin Plain in the Late Neolithic period.

6.3.1 Sample selection

A total of 22 painted pottery sherd samples were selected from the C14-dated sequences of the Ebrahimabad site for analyses. The sherds comprised two different collections of Sialk type pottery from Trenches I, II and III and included 12 painted sherds from Silak I type and 10 painted sherds from Silak II type. The samples of each collection were randomly selected from the two groups of the excavated pottery on the basis of their appearance, that is, colour and decoration. Sialk I type pottery samples were selected from the excavated buff pottery group and Sialk II samples from the red pottery group. The stratigraphic sequences and the absolute chronology of the three excavated trenches are shown in Table 6.7. The details of various analysis carried out on the samples, and the results, will be discussed below.

6.3.2 Chemical composition

The collection of 22 sherds from Tepe Ebrahimabad were all analysed utilising X-ray fluorescence (XRF). Tables 6.8 illustrates the chemical compositions of the Sialk I type buff and II type red pottery of Ebrahimabad.

It can be seen that Sialk I and II types of pottery from Ebrahimabad show relatively similar compositions, with the exception of some Sialk II type pottery. Indeed, the last 2 samples of Table 6.8 exhibit distinctly lower CaO content, resulting in unusually high value of the standard deviation. However, the CaO content usually exhibits a relatively high value of standard deviation. As previously stated, this is not unusual within Sialk pottery and can be attributed to the variation of the content of this oxide showing the greatest change among the six most abundant elemental oxides in the original clay deposits. In burial environments, a variety of processes may also alter the chemical composition of pottery, such as cation leaching and exchange. On the basis of these results, it may be deduced that the pottery of Ebrahimabad site studied here was made using a single resource of clay raw material or clay from very similar resources. On the other hand, the relatively high content of CaO in most of the specimens indicates the use of calcareous clays as the source of raw material in the fabrication of the pottery sherds studied.

The Principal Component Analysis (PCA) plot carried out on the XRF chemical composition data of Ebrahimabad I and II pottery samples is depicted in Figure 6.18 From this figure it can be inferred that the group of pottery samples comprising the Ebrahimabad I, as well as Ca-rich samples of the Ebrahimabad II period exhibited considerable clustering of the pottery compositions, whereas, the Ca-poor samples of the Ebrahimabad II period showed discrete clustering which was separated from the first group of samples. These results were also in conformity with the above discussion concerning the homogeneity of the chemical compositions within both groups of Ebrahimabad I and II pottery and the similarity and difference of compositions between the Ebrahimabad I pottery and Ca-rich and Ca-poor pottery of Ebrahimabad II, respectively.

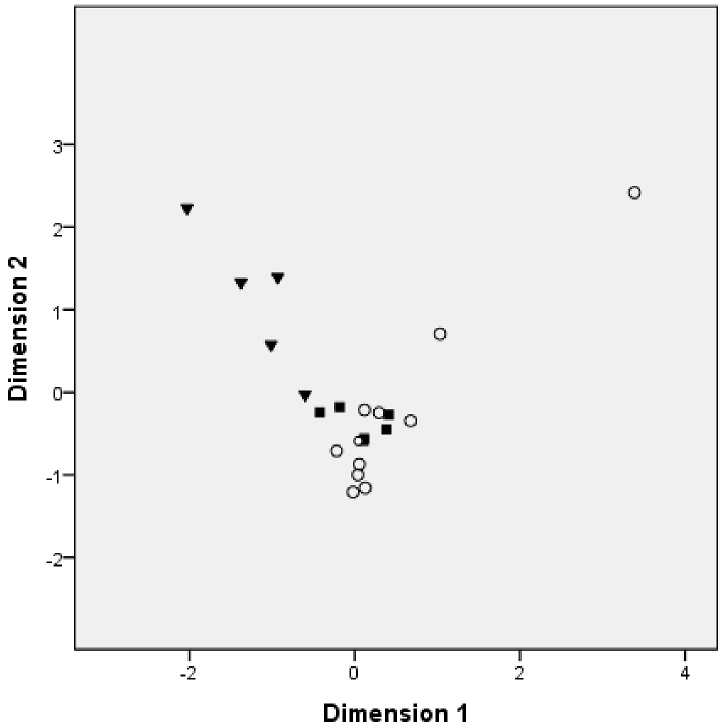


Figure 6.18 PCA of Ebrahimabad Ware samples. The site abbreviations are as follows: O Ebrahimabad I (n = 12), ■ O Ebrahimabad II, Ca-rich (n = 5), ▼ Ebrahimabad II, Ca-poor (n = 5).

6.3.3 Mineralogical analysis

A total of 13 sherds from Ebrahimabad, 5 and 8 samples from the Sialk I and II types respectively, were selected randomly and analysed by powder X-ray diffraction technique (XRD). Figure 6.19 illustrates the PXRD traces of some typical Sialk I and II type samples from Ebrahimabad (see Appendix D for full traces) and Table 6.9 summarises their mineralogical analyses. Table 6.9 demonstrates that minerals such as Quartz and Augite (Calcium Aluminum Iron Magnesium Silicate, ($Al_{0.42}$ $Ca_{0.818}$ $Fe_{0.269}$ $Mg_{0.792}$ $O_{0.6}$ $Si_{1.751}$), which is different from the Augite phase present in Sialk II specimens from Sialk, are the major phases present in almost all Sialk I type pottery sherds. Moreover, the presence of Calcite and Illite is evident in some specimens, especially the older ones (e.g. E1p). It is interesting to note that Sialk II type specimens are also composed of the same Quartz and Augite minerals as the Sialk I type sherds, plus a hematite phase in some sherds.

6.3.4 Microstructural Examinations

The microstructural details of selected pottery from Ebrahimabad were also studied utilising the SEM (see Appendix C for full SEM micrographs). Some characteristics of the pottery, such as their degree of sintering and vitrification, the size and morphology of their particles, pores morphology and volume and the uniformity of structure were analysed. The chemical compositions of some sections of pottery, or particles present in the sherds, were also determined by an energy-dispersive X-ray analyser (EDX) attached to the SEM. SEM micrographs and the elemental spectra showing the microstructural details of some Sialk I and II type pottery from Ebrahimabad are presented in figurers 6.20-6.24 and 6.25-6.29, respectively. The relatively uniform microstructures of all the samples and the absence of large and angular particles again indicate the use of secondary (sedimentary) clays in making this pottery. It also seems that no inorganic tempers have deliberately been added to the starting clays. However, the traces of plant tempers, such as fine chaff or dung, can be seen on the cross-sections of some pottery (Figures 6.23, 6.25). The micrographs of Sialk I type pottery from Ebrahimabad (Figures 6.20-6.24) show that they are quite dense and well vitrified and, because of their higher content of SiO_2 and Al_2O_3 and lower CaO content, they are more refractory. Therefore, it appears that they were fired at much higher temperatures in comparison with Sialk I type pottery from the site of Sialk itself.

Sialk II type sherds from Ebrahimabad were also very dense, highly vitrified with relatively pore free microstructures (Figures 6.25-6.29). They can again be assumed to have been fired at higher temperatures in comparison with Sialk I type pottery from the same site and also could be evaluated as having higher quality in comparison with the latter pottery. On the other hand, the SEM elemental map showed no difference between content of iron on the interior and exterior of the red specimens (e.g. Figure 6.30). As shown on Table 6.10, this is also true for other red pottery from Ebrahimabad. Hence, contrary to some Sialk II specimens from Sialk, the presence of a red iron rich coating on the outer surface of the Sialk II type red pottery from Ebrahimabad should be ruled out. As a result, the red surface colour of the aforementioned pottery should be attributed to other factors.

Table 6.7 C14 dated **sequences of some Ebrahimabad pottery samples.**

Pottery ID	Context	Trench	Period	Calibrated date with 95% probability (BC)
E1t	266	II	Late Neolithic II (Late)	5518 -5372
E1r	260	II	Late Neolithic II (Late)	5518 -5372
E1k	248	II	Late Neolithic II (Late)	5378-5218
E1l	248	II	Late Neolithic II (Late)	5378-5218
E1n	247	II	Late Neolithic II (Late)	5378-5218
E1p	246	II	Late Neolithic II (Late)	5378-5218
E1o	244	II	Late Neolithic II (Late)	5378-5218
E1f	157	I	Late Neolithic II (Late)	5356-5216
E1c	361	III	Late Neolithic II (Late)	5230-5051
E1g	361	III	Late Neolithic II (Late)	5230-5051
E1s	349	III	Late Neolithic II (Late)	5228-5032
E1u	330	III	Late Neolithic II (Late)	5220-5011
E2f	214	II	Transitional Chalcolithic (Early)	5320-5206
E2g	214	II	Transitional Chalcolithic (Early)	5320-5206
E2b	355	III	Transitional Chalcolithic (Early)	5230-5051
E2d	355	III	Transitional Chalcolithic (Early)	5230-5051
E2c	349	III	Transitional Chalcolithic (Early)	5228-5032
E2a	346	III	Transitional Chalcolithic (Early)	5228-5032
E2e	342	III	Transitional Chalcolithic (Early)	5228-5032
E2n	207	II	Transitional Chalcolithic (Early)	5060-4882

Table 6.8 The chemical composition of the Ebrahimabad Sialk I and II type specimens (wt%).

Oxide/ Sample	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	Fe_2O_3
E1s	0.87	1.77	9.44	46.7	0.32	4.54	18.73	1.37	13.24
E1c	0.3	1.55	11.33	49.2	0.32	5.19	12.15	1.42	16.48
E1t	1.43	1.62	11.05	48.6	0.5	4.35	14.95	1.34	15.72
E1f	0.96	1.66	10.93	47.46	0.56	5.27	14.9	1.3	14.86
E1g	0.59	1.68	11.51	49.84	0.47	4.84	12.16	1.26	15.75
E1r	2.75	2.29	10.35	48.1	0.45	4.86	13.07	1.31	15.05
E1k	0.56	1.69	11.71	51.19	0.37	5.58	12.5	1.38	13.29
E1l	0.41	1.64	10.6	48.81	0.55	5.19	16.5	1.39	13.46
E1p	1.29	1.84	9.69	48.22	0.38	4.58	18.51	1.39	12.28
E1n	0.2	1.67	10.08	47.04	0.41	4.99	20.81	1.29	11.89
E1o	0.44	1.53	8.81	41.65	0.99	5.29	27.27	1.4	10.32
E1u	0.45	1.72	10.03	48.04	0.4	4.32	20.11	1.2	12.43
Average	**0.89**	**1.72**	**10.5**	**47.89**	**0.48**	**4.97**	**16.5**	**1.35**	**13.85**
SD	**0.73**	**0.21**	**0.92**	**2.43**	**0.19**	**0.38**	**4.63**	**0.05**	**1.9**
Oxide/ Sample	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**P_2O_5**	**K_2O**	**CaO**	**TiO_2**	**Fe_2O_3**
E2a	0.43	1.53	10.37	48.01	0.38	4.25	17.48	1.54	14.86
E2b	0.03	1.26	10.37	47.04	0.32	4.3	18	1.65	15.78
E2d	0.3	1.55	10.34	45.97	0.29	4.01	19.91	1.61	14.82
E2e	0.34	1.54	10.63	46.79	0.55	4.8	16.6	1.59	16
E2f	0.22	1.09	9.65	48.97	1.44	5.46	17.88	1.37	12.38
E2n	0.79	1.53	10	46.93	0.47	4.41	19.82	1.34	13.43
E2g	0.45	1.35	8.54	48.14	2.92	5.22	18.34	1.23	11.85
E2c	0.42	1.51	11.33	52.07	0.34	4.19	11.01	1.65	16.35
E2h	0.3	1.45	11.89	57.12	0.31	4.37	2.81	1.93	18.8
E2i	0.18	1.01	11.27	55.2	0.36	4.37	8.6	1.93	15.88
Average	**0.35**	**1.38**	**10.44**	**49.62**	**0.74**	**4.54**	**15.05**	**1.58**	**15.02**
SD	**0.2**	**0.2**	**0.95**	**3.86**	**0.84**	**0.47**	**5.68**	**0.23**	**2.05**

Table 6.9 Major crystalline phases present in the typical pottery sherds of Ebrahimabad

Pottery ID	Site	Type	Surface colour	Colour of core	Major phases (JCPDS card No.)
E1s	Ebrahimabad	Sialk I	Buff	Buff	Augite (071-0721), Quartz (001-0649)
E1p	Ebrahimabad	Sialk I	Buff	Buff	Augite (071-0721, Quartz (001-0649, Illite (009-0343), Calcite (001-0837)
E2b	Ebrahimabad	Sialk II	Red	Buff	Augite (071-0721), Quartz (001-0649, Hematite (001-1053)
E2d	Ebrahimabad	Sialk II	Red	Buff	Augite (071-0721), Quartz (01-0649, Hematite (001-1053)
E2h	Ebrahimabad	Sialk II	Red	Red	Augite (071-0721), Quartz (001-0649, Hematite (001-1053)

Table 6.10 Difference in content of iron between exterior surfaces and core in Ebrahimabad pottery.

Pottery ID	Type of pottery	Surface colour	Core colour	With red coating	Without coating	Fe2O3 content of surface and core respectively (wt %)*	Context
E2c	SialkII Ebrahimabad	Red	Buff		*	5.85, 4.4.85	349
E2b	Sialk II Ebrahimabad	Red	Buff		*	4.93, 4.05	355
E2a	Sialk II Ebrahimabad	Red	Buff		*	4.11,3.44	346
E2d	Sialk II Ebrahimabad	Red	Buff		*	4.37, 3.41	355
E2e	Sialk II Ebrahimabad	Red	Red		*	5.05, 3.68	342
E2h	Sialk II Ebrahimabad	Red	Red		*	6.06, 7.58	207
E2i	Sialk II Ebrahimabad	Red	Red		*	5.06, 5.92	207

*Average values of 10 measurements.

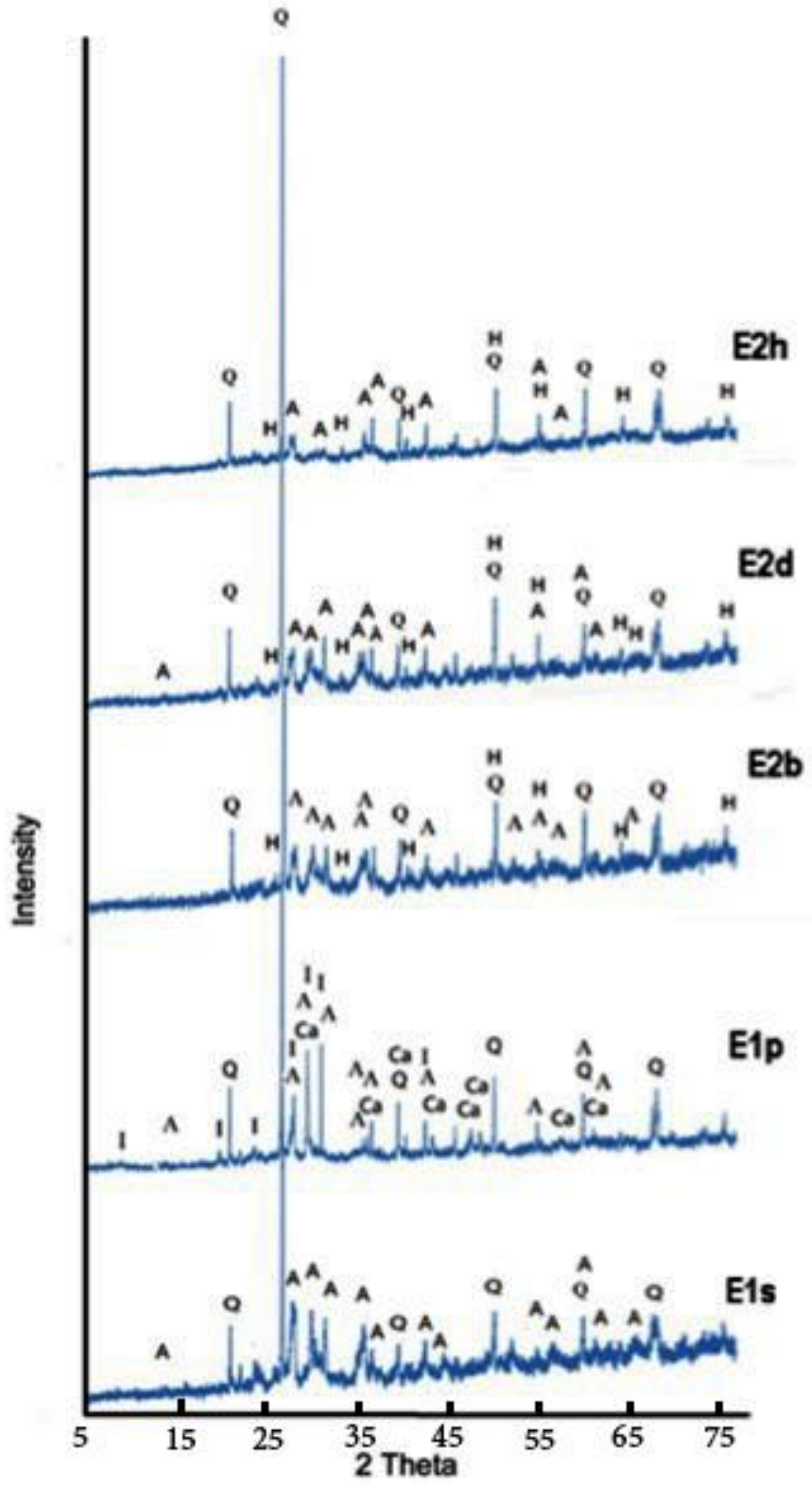


Figure 6.19 XRD traces of some typical pottery specimens of Ebrahimabad: Q = Quartz (01-0649), A = Augite (071-0721), I= Illite (09-0343), H = Hematite (01-1053) and Ca = Calcite (01-0837).

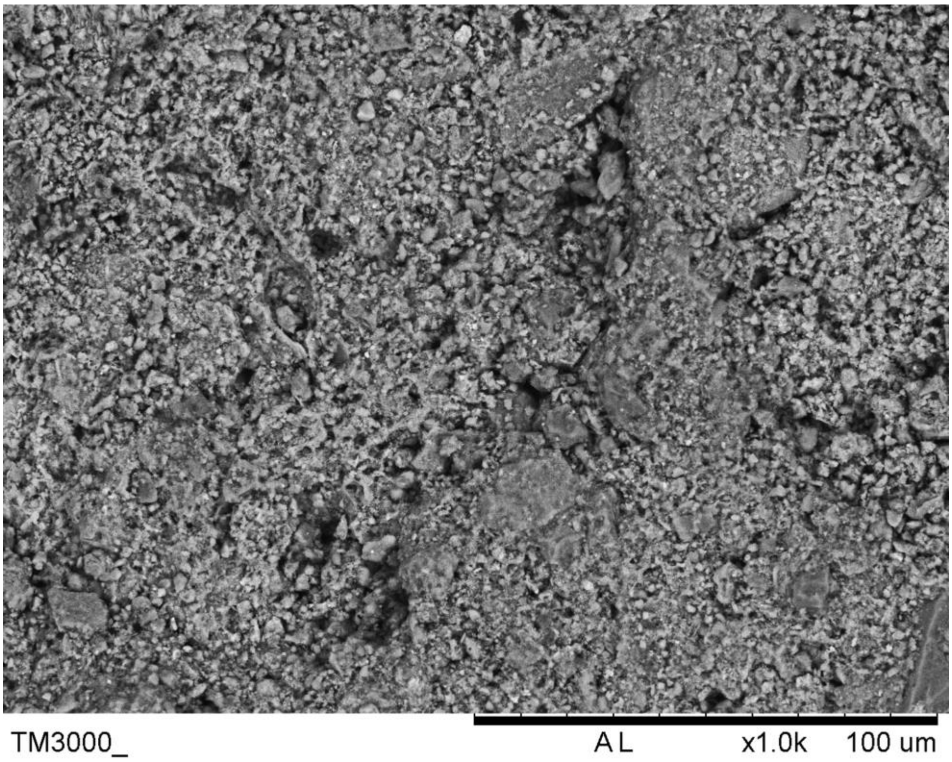


Figure 6.20 SEM micrograph of Sample E1c, exterior surface.

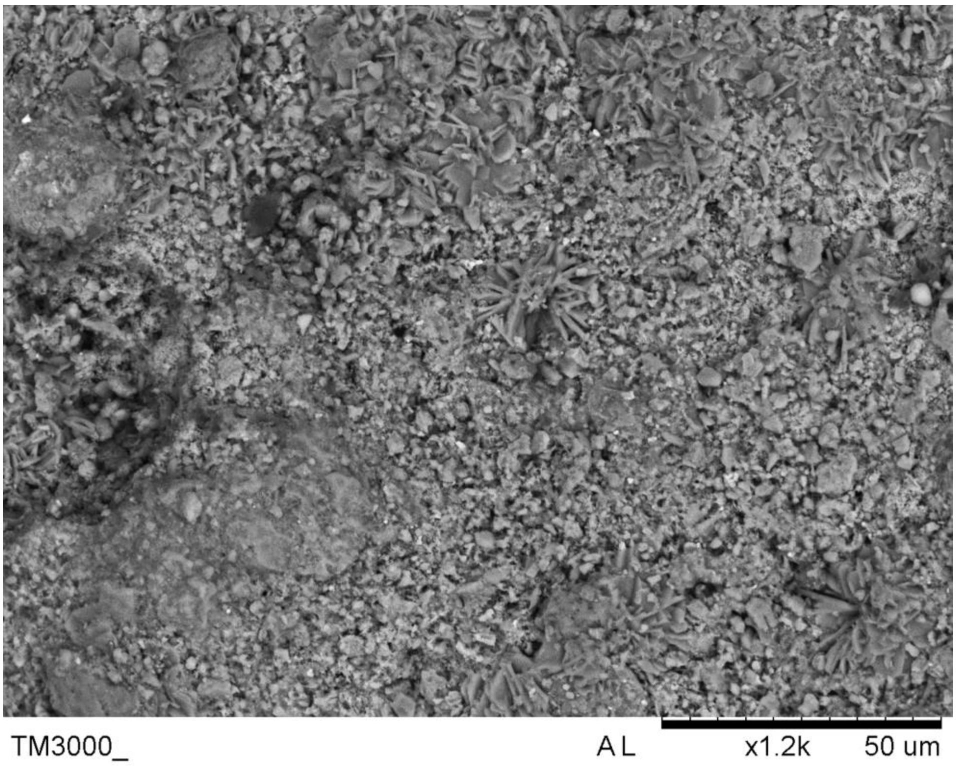


Figure 6.21 Sample E1r, exterior surface.

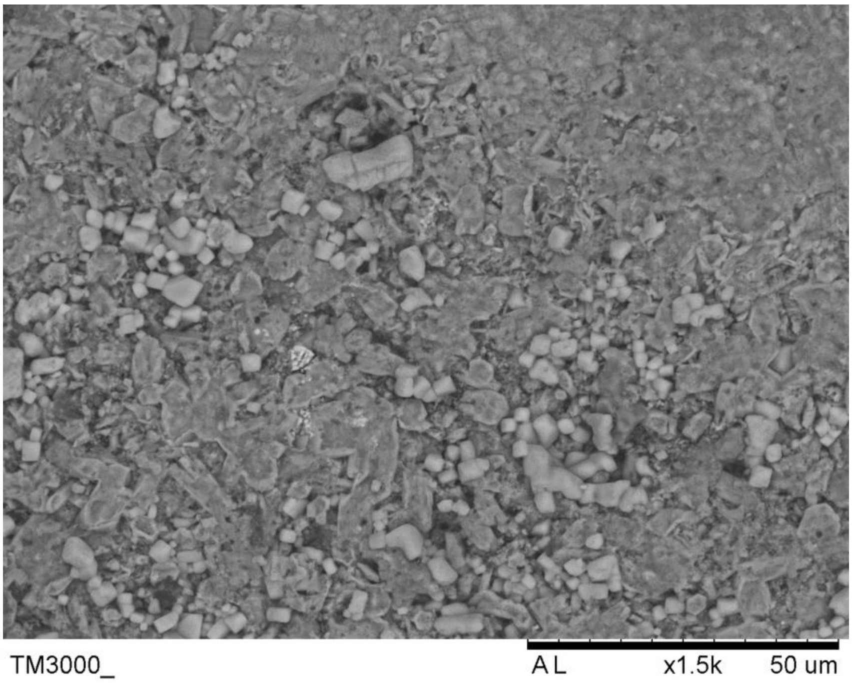


Figure 6.22 SEM micrograph of Sample E1s, interior surface.

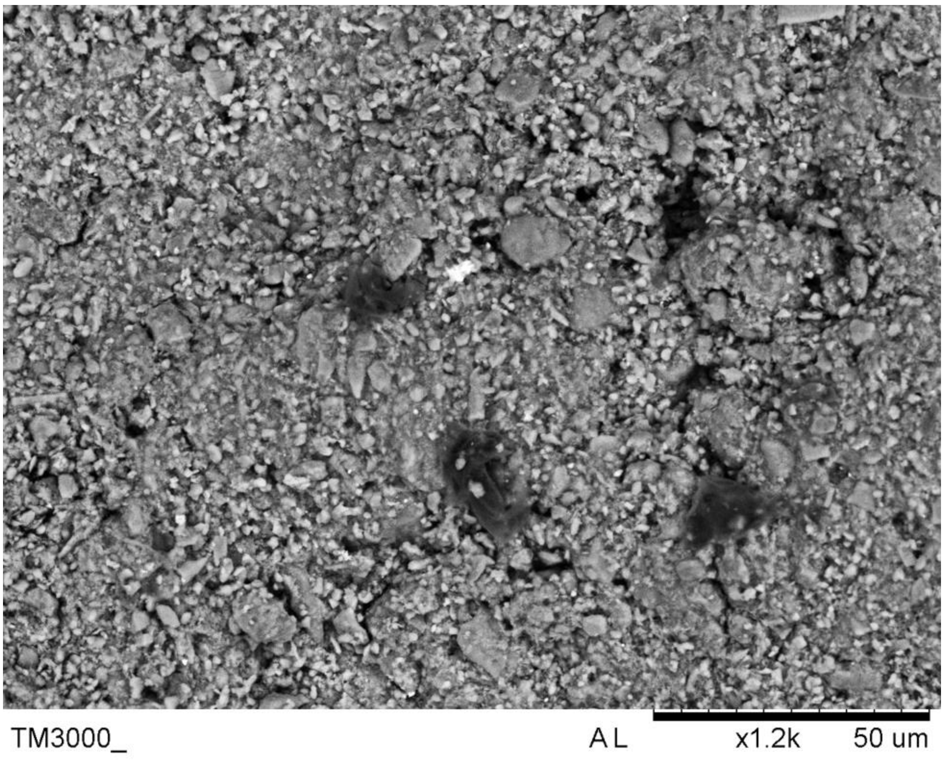


Figure 6.23 SEM micrograph of Sample E1t exterior surface.

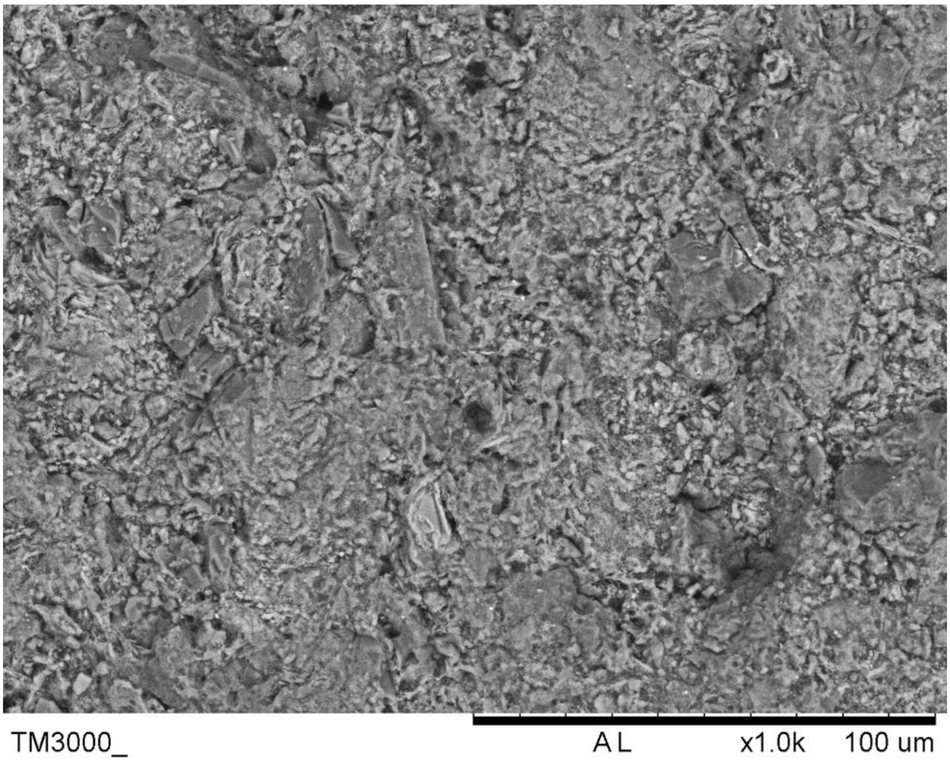
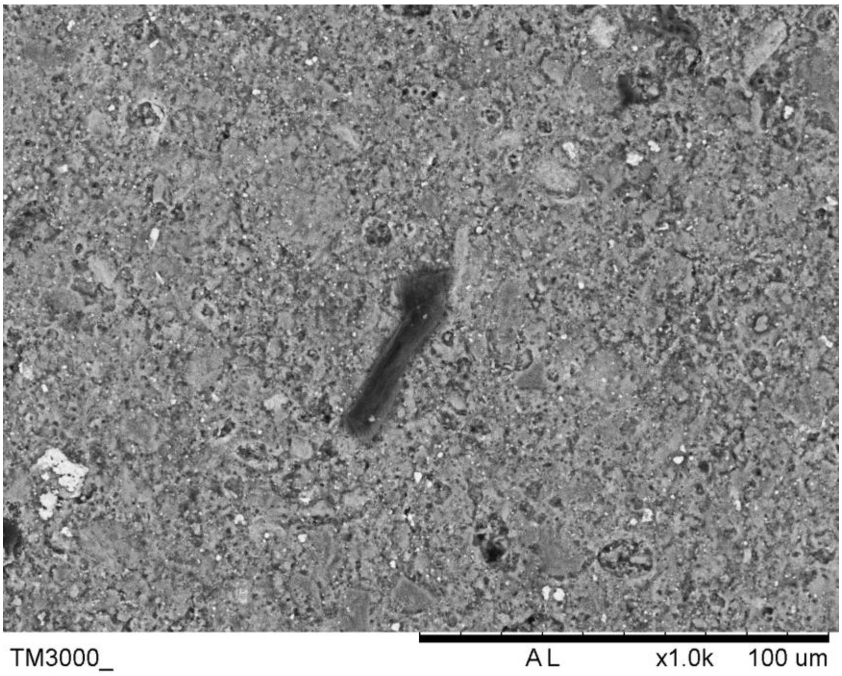
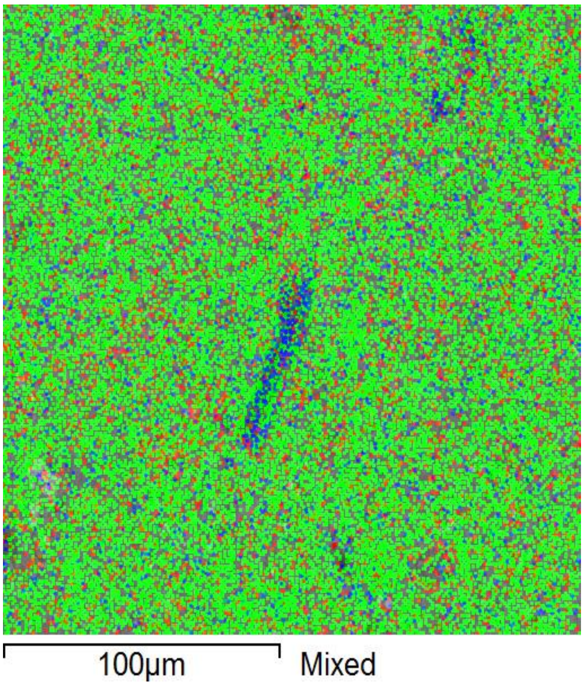


Figure 6.24 SEM micrograph of Sample E1p, core



(a)



(b)

Figure 6.25 (a) Sample E2i exterior surface. (b) Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue).

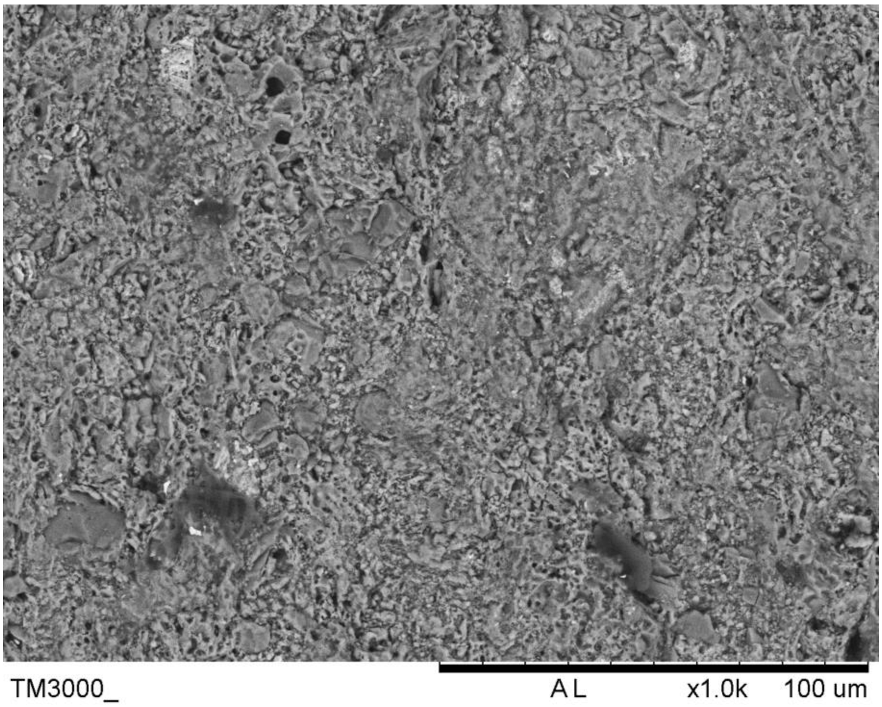


Figure 6.26 SEM microstructure of Sample E2i, core.

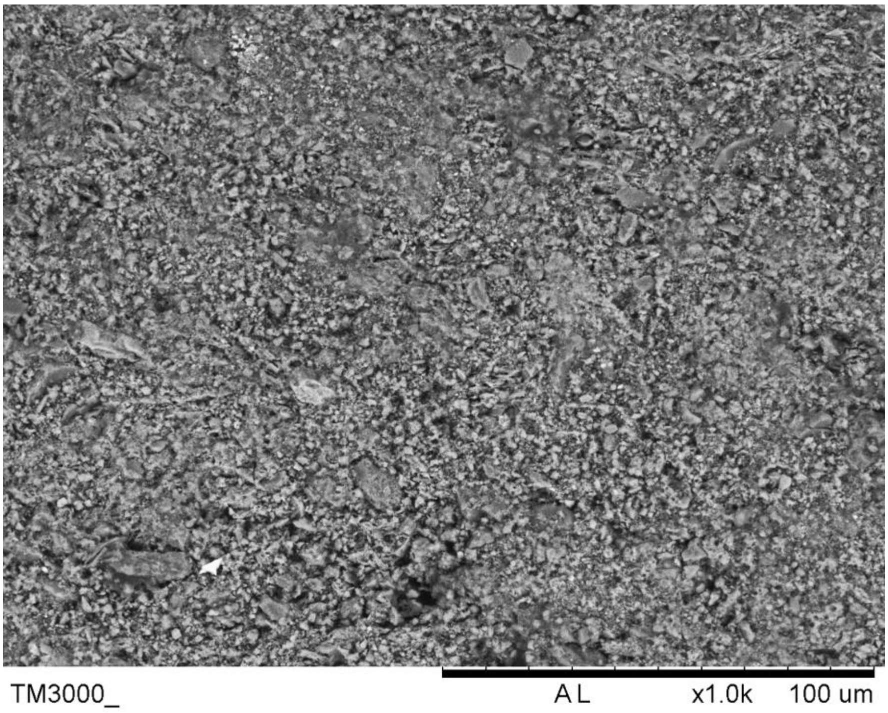


Figure 6.27 SEM microstructure of Sample E2e, core

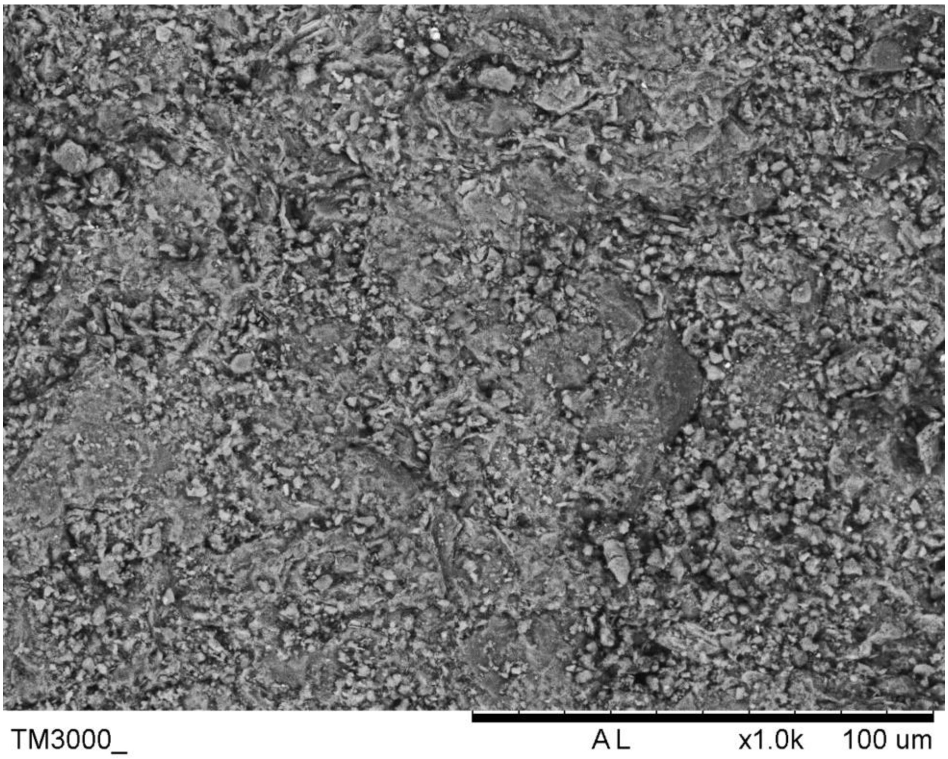


Figure 6.28 SEM microstructure of Sample E2h, exterior surface.

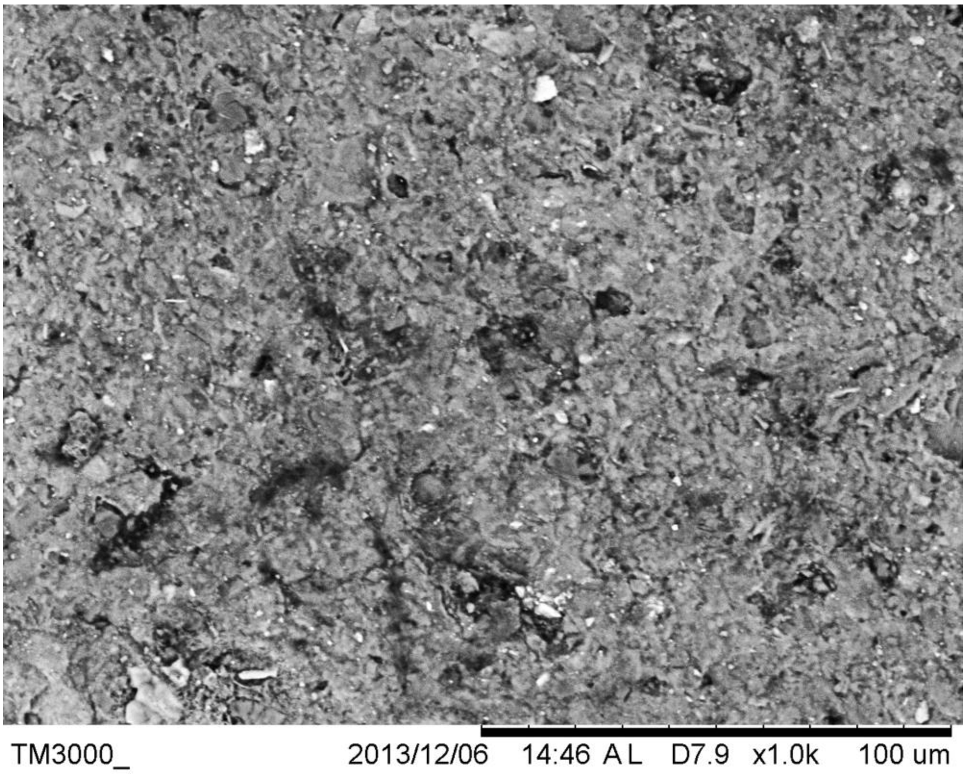
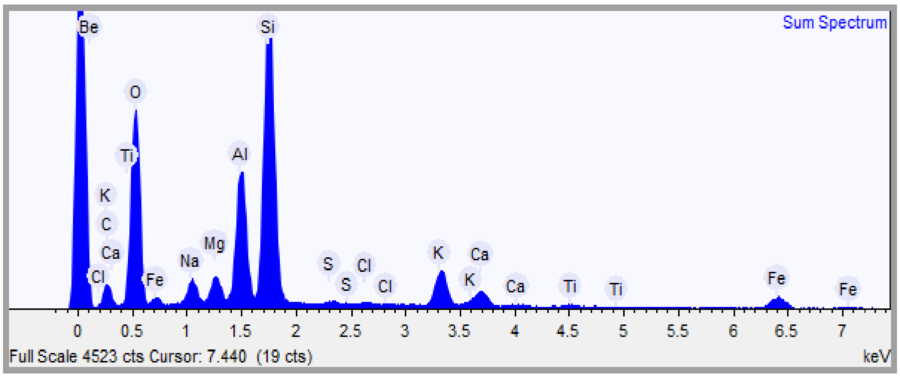


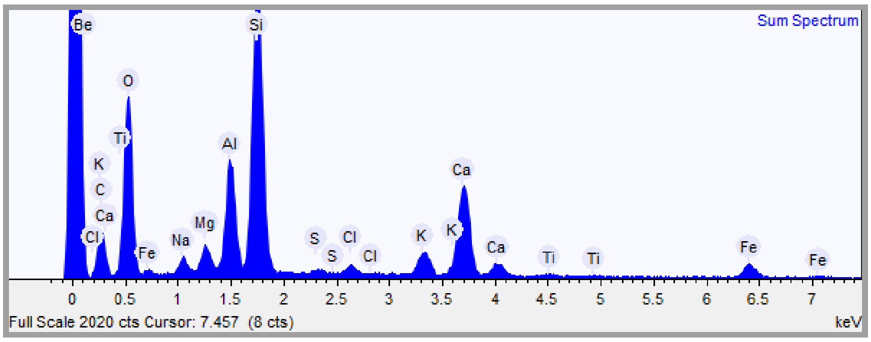
Figure 6.29 SEM microstructure of Sample E2b, exterior surface.



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	7.246	2.894	11.756
Oxygen	49.704	1.592	60.539
Sodium	2.142	0.114	1.816
Magnesium	1.773	0.095	1.421
Aluminum	8.000	0.277	5.777
Silicon	19.931	0.651	13.828
Sulfur	0.240	0.053	0.146
Chlorine	0.194	0.052	0.107
Potassium	3.955	0.155	1.971
Calcium	1.730	0.096	0.841
Titanium	0.390	0.071	0.159
Iron	4.695	0.229	1.638

(a)



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	16.415	2.965	25.290
Oxygen	45.683	1.699	52.838
Sodium	1.093	0.101	0.880
Magnesium	1.274	0.096	0.970
Aluminum	4.999	0.215	3.428
Silicon	15.056	0.573	9.920
Sulfur	0.223	0.060	0.129
Chlorine	0.576	0.073	0.301
Potassium	1.868	0.113	0.884
Calcium	8.416	0.341	3.885
Titanium	0.331	0.088	0.128
Iron	4.066	0.260	1.347

(b)

Figure 6.30 A typical elemental spectrum of the Sample E2d with a red coating. (a) Core. (b) Exterior surface.

6.4 Tepe Pardis

As already noted, Tepe Pardis is a mound of some seven metres in height above the surrounding ground level and covers an area of 4,200 square metres. The three seasons of excavations in 2004, 2006 and 2007 yielded Sialk I and II pottery sherds which were studied in this project.

6.4.1 Sample selection

A sample of 28 sherds from the absolute-dated sequences of Tepe Pardis were studied and included 12 painted sherds from Sialk I type (Late Neolithic type (Late Neolithic painted black on buff Wares) and 16 painted sherds from Sialk II type (Transitional Chalcolithic painted black on red). The details of stratigraphic sequences (Coningham et al. 2006; Fazeli et al. 2007) and the absolute chronology of excavated three trenches I, II and II, are shown in Table 6.11. Details of the analysis carried out on the samples and their results will be discussed below.

6.4.2 Chemical composition

The collection of 28 sherds was subjected to X-ray fluorescence (XRF) in order to determine their chemical composition. Tables 6.12 illustrates the chemical compositions of both Sialk I and II types from Pardis. It can be seen that Sialk I type specimens show relatively homogeneous compositions, whereas the chemical compositions of Sialk II type specimens show the existence of two different types of pottery, calcium rich and poor in calcium each group having homogeneous compositions within themselves. However, the CaO content usually exhibits relatively high value of standard deviation. As previously stated when discussing the pottery from other sites, the variation of CaO is not an unusual event and can be attributed to the variation of the content of this oxide in the original clay deposits, which could mainly be attributed to the cation leaching and exchange.

The first group of Sialk II type specimens from Pardis (calcium rich), which have almost similar compositions to Sialk I type specimens of this site; apparently made using the same clay raw materials as Sialk I type pottery. These vessels are distinguished by the strong red colour of their surface and buff colour of the core while the specimens of the second group, which were red both on the core and on the surface, are the product of different raw materials. Therefore, it can be inferred that both the Calcium-rich samples of Sialk II type and all Sialk I type samples from Pardis, have been made using calcareous clays as the source of raw material. In contrast, the calcium- poor samples of Sialk II type have possibly been fabricated from a different source of raw materials (clays).

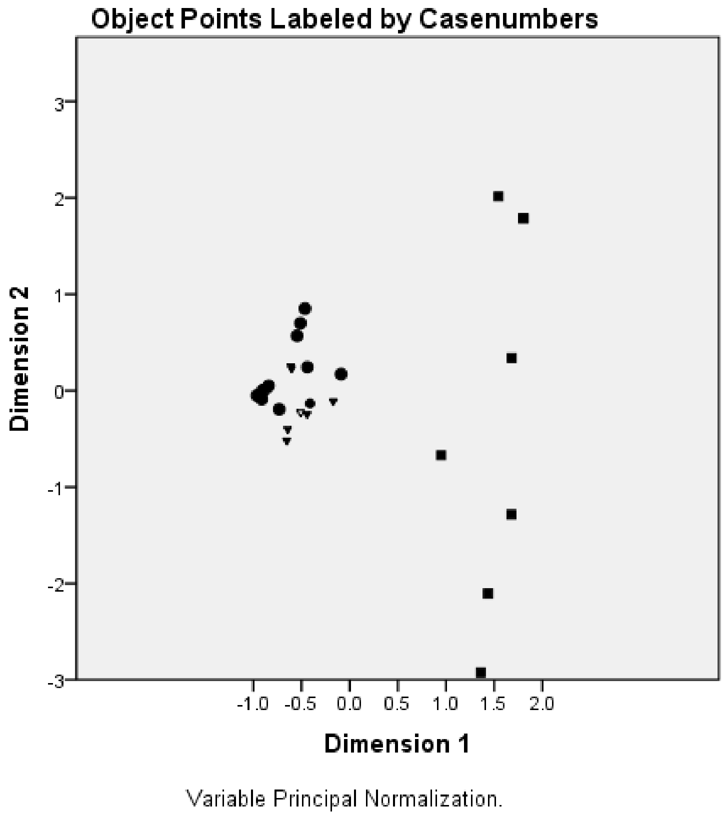


Figure 6.31 PCA of Pardis I and II Ware samples. The site abbreviations are as follows: ■ Ca-poor Pardis II samples (n = 8), ▼ Ca-rich Pardis II samples (n = 8), ● Pardis I samples (n = 12).

The Principal Component Analysis (PCA) results carried out on the XRF data of Pardis I and II pottery samples is depicted in Figure 6.31.The plot shows that a group of pottery samples comprising the Pardis I, as well as Ca-rich samples of the Pardis II period exhibited distinct clustering of the pottery compositions. On the other hand, the compositions of a group of Ca-poor samples of the Pardis II period, while showing considerable scattering within the group, was effectively separated from the first group of samples.

These results were in conformity with the above discussion concerning the homogeneity of the chemical compositions within both of Pardis I and II pottery groups and the similarity of compositions between the Pardis I pottery and Ca-rich pottery of Pardis II which significantly differs from those of the Ca-poor pottery of Pardis II.

6.4.3 Mineralogical analysis

Figure 6.32 illustrates the PXRD traces of selected Sialk I and II type samples from Pardis (see Appendix D for full traces) and Table 6.13 summarises their mineralogical analyses. As can be seen in Table 6.13, minerals such as Quartz and Augite (Aluminium Iron Magnesium Silicate) and similar to the Augite mineral from pottery at Ebrahimabad, are the major phases present in almost all Sialk I type pottery sherds as well as calcium rich specimens of Sialk II type. However, the specimens poor in calcium possessed Quartz, Hematite and another major phase, structurally similar to a Orthopyroxene mineral (Iron Magnesium Calcium Silicate) with the following formula: ($Ca_{0.043}Fe_{0.802}Mg_{1.155}O_6Si_2$,CPDS card No. 01-086-0163).

It is well known that any single pottery sherd owing to the complexity of its chemical composition, sometimes contains more than 10 oxides and variability of the firing procedure is quite unique. Therefore, it is very difficult to identify the mineral phases appearing in XRD traces of pottery. In this study, each given specimen was compared with the reference card in several 2θ values (mostly more than 10). Obviously, exact matches were never observed but, by some variation in the height and position of peaks, some acceptable matches were obtained, which had the best fit amongst the minerals exhibiting similar XRD traces.

6.4.4 Microstructural Examinations

Figures 6.33-6.37 and 6.38-6.41 present the SEM micrographs of Sialk I and II type pottery sherds from Tepe Pardis, respectively (see Appendix C for full SEM micrographs). These sherds generally exhibit more uniform and dense microstructures in comparison with samples from other sites studied. There is also no sign of the addition of inorganic tempers and the absence of large and angular particles again indicate the use of sedimentary clays in making these pottery. However, the traces of plant tempers, fine chaff or dung, can be seen on the cross sections of some pottery (Figure 6.36). Moreover, Sialk II type sherds, with lower calcium content, exhibited denser, pore free and highly vitrified microstructures (Figures 6.38-6.41) in comparison with Sialk I type, and calcium rich Sialk II type pottery samples from the same location. These samples are also more refractory due to their higher content of SiO_2 and lower CaO. Therefore, it can be postulated that they were fired at higher temperatures in comparison with Sialk I type pottery from Pardis.

The SEM elemental map on Figure 6.42 indicates that there is no difference between the content of iron on the interior and outer surface of the specimen P2c, which is a calcium rich specimen of Sialk II type, thus revealing the absence of the red coating on their surface. As shown on Table 6.14, this is also true for other red pottery from Pardis. Therefore, counter to some Sialk II specimens belonging to Sialk, the presence of a red iron rich coating on the outer surface of the Sialk II type red pottery at Pardis should be ruled out. Although it was observed that the majority of Sialk II type red pottery specimens which are red both on the core and surface belong to the low calcium type of pottery specimens, some of them are of the calcium rich type (Table 6.14). Therefore, it can be postulated that other factors have also been in operation to produce the aforementioned red-red pottery and it can be proposed a distinct change from the buff-colour Sialk I type vessels to the well-made dense and strong red pottery of Sialk II type. This could have been achieved first by better mastering of the firing techniques, by exercising a more precise control on the firing temperature, time and atmosphere, which were only possible by constructing relatively advanced kilns. In the later stages this could also have been through the more careful selection of raw materials to produce the aforementioned low calcium Sialk II type pottery, exhibiting denser and highly vitrified microstructures. These latter samples are also red both on surface and core.

***Table 6.11 C14 dated sequences of the selected Pardis pottery samples*.**

Pottery ID	Context	Trench	Period	Calibrated date with 95% probability (BC)
P1b	7023	VII	Late Neolithic II (Late)	5600-5200*
P1c	7023	VII	Late Neolithic II (Late)	5600-5200*
P1d	7023	VII	Late Neolithic II (Late)	5600-5200*
P1f	7023	VII	Late Neolithic II (Late)	5600-5200*
P1g	7021	VII	Late Neolithic II (Late)	5310-5080
P1h	7021	VII	Late Neolithic II (Late)	5310-5080
P1a	7018	VII	Late Neolithic II (Late)	5310-5080
P1e	7018	VII	Late Neolithic II (Late)	5310-5080
Pottery ID	**Context**	**Trench**	**Period**	**Calibrated date with 95% probability (BC)**
P2c	7017	VII	Transitional Chalcolithic (Early)	5280-5050
P2f	7017	VII	Transitional Chalcolithic (Early)	5280-5050
P2h	7017	VII	Transitional Chalcolithic (Early)	5280-5050
P2i	7015	VII	Transitional Chalcolithic (Early)	5280-5050
P2j	7015	VII	Transitional Chalcolithic (Early)	5280-5050
P2t	7015	VII	Transitional Chalcolithic (Early)	5280-5050
P2z	7015	VII	Transitional Chalcolithic (Early)	5280-5050
P2v	7015	VII	Transitional Chalcolithic (Early)	5280-5050
P2a	7013	VII	Transitional Chalcolithic (Early)	4920-4800
P2b	7007	VII	Transitional Chalcolithic (Early)	4920-4800
P2d	7006	VII	Transitional Chalcolithic (Early)	4920-4800

*Without C14 dates.

P2g	7005	VII	Transitional Chalcolithic (Early)	4830-4680
P2e	7005	VII	Transitional Chalcolithic (Early)	4830-4680
P2k	7004	VII	Transitional Chalcolithic (Early)	4830-4680
P2s	7004	VII	Transitional Chalcolithic (Early)	4830-4680
P2m	7004	VII	Transitional Chalcolithic (Early)	4830-4680

Table 6.12 The chemical composition of the Sialk I and 2 types of pottery from Pardis. (wt%).

Oxide/ Sample	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	Fe_2O_3
P1a	0.12	1.85	10.63	48.26	0.31	4.57	17.25	1.45	14.48
P1b	0.04	1.8	9.3	48.12	0.31	3.82	18.63	1.2	15.05
P1c	0.29	1.89	9.83	49.63	0.37	3.21	19.44	1.26	12.93
P1d	0.38	1.69	9.68	52.62	0.43	4.39	15.09	1.29	13.31
P1e	0.23	1.76	9.75	49.96	0.35	3.89	17.73	1.35	13.87
P1f	0.46	1.59	9.44	50.58	0.37	4.17	17.71	1.24	12.51
P1g	0.62	1.53	10.17	52.05	0.49	4.39	14.01	1.26	14.01
P1h	0.56	1.83	10.59	48.85	0.28	4.2	17.13	1.23	14.08
P1i	0.18	1.51	8.23	51.09	0.22	4.8	18.55	1.11	13.75
P1j	0.46	2.02	9.99	52.29	0.48	3.44	13.68	1.3	14.98
P1k	0.36	1.85	10.41	51.47	0.4	4.21	14.52	1.28	14.17
P1l	0.44	1.83	9.4	48.31	0.28	3.95	19.78	1.21	13.61
Average	0.34	1.74	9.92	50.01	0.36	4.08	16.96	1.29	13.78
SD	0.21	0.13	0.5	1.67	0.07	0.43	2.12	0.08	0.83
Oxide/ Sample	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**P_2O_5**	**K_2O**	**CaO**	**TiO_2**	**Fe_2O_3**
P2c	0.44	1.74	10.35	54.71	0.23	4.54	10.79	1.32	14.77
P2f	0.77	1.79	9.51	50.15	1.36	4.6	16.31	1.23	12.77
P2h	0.34	1.74	10.1	50.43	0.27	4.71	15.14	1.28	14.8
P2i	0.11	1.67	10.81	53.54	0.36	4.59	10.29	1.21	16.21
P2j	0.22	1.65	9.99	54.57	0.53	4.63	11.91	1.28	13.44

P2t	0.43	1.62	9.53	53.11	0.41	4.78	14.37	1.54	13.76
P2z	0.52	1.73	10.24	51.37	0.65	4.75	14.87	1.63	13.55
P2v	0.27	1.69	11.03	52.37	0.23	5.07	13.44	1.77	13.61
Average	0.39	1.70	10.20	52.53	0.51	4.71	13.4	1.41	14.11
SD	0.19	0.05	0.51	1.65	0.35	0.16	2.04	0.20	1.02
Oxide/ Sample	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**P_2O_5**	**K_2O**	**CaO**	**TiO_2**	**Fe_2O_3**
P2a	0.57	1.18	12.02	62.39	0.25	4.49	3.07	1.42	14.41
P2b	0.06	1.26	11.48	60.37	0.3	3.82	7.01	1.94	13.07
P2d	0.44	1.36	12.16	61.97	0.26	4.68	3.17	1.38	14.73
P2g	0,22	1.49	11.49	62.27	0.2	4.69	3.21	1.4	14.88
P2e	0.63	1.06	10.88	60.45	0.63	4.44	4.86	1.3	15.69
P2k	0.13	1.15	12.25	62.53	0.65	3.18	4.02	1.58	14.06
P2s	0.42	1.28	12.74	61.26	0.41	4.11	4.66	1.67	14 .43
P2m	0.32	1.11	12.56	63.07	0.59	3.96	5.39	1.44	11.43
Average	0.37	1.24	11.95	61.79	0.41	4.17	4.4	1.52	14.04
SD	0.20	0.13	0.58	0.93	0.17	0.48	1.27	0.19	1.30

Table 6.13 Major Crystalline Phases Present in the Typical Pottery Sherds of Pardis.

Pottery ID	**Site**	**Type of pottery**	**Surface colour**	**Colour of core**	**Major phases (JCPDS card No.)**
P1b	Pardis	Sialk I	Buff	Buff	Augite (071-0721), Quartz (001-0649
P1a	Pardis	Sialk I	Buff	Buff	Augite (071-0721), Quartz (001-0649
P2c	Pardis	Sialk II	Red	Red	Augite (071-0721), Quartz (001-0649), Hematite (001-1053)
P2h	Pardis	Sialk II	Red	Buff	Augite (071-0721), Quartz (01-0649)
P2b	Pardis	Sialk II	Red	Red	Orthopyroxene (086-0163), Quartz (001-0649), Hematite (001-1053)
P2e	Pardis	Sialk II	Red	Red	Orthopyroxene (086-0163), Quartz (001-0649), Hematite (001-1053)
P2g	Pardis	Sialk II	Red	Red	Orthopyroxene (086-0163), Quartz (001-0649), Hematite (001-1053)

***Table 6.14 Difference in content of iron between exterior surface and core in the selected Pardis pottery*.**

Pottery ID	Type of pottery	Surface colour	Core colour	With red coating	Without coating	Fe_2O_3 content of surface and core respectively (wt %)*	Context
P2a	Sialk II Pardis	Red	Red		*	6.04, 4.36	7013
P2c	Sialk II Pardis	Red	Red		*	4.61, 4.20	7017
P2e	Sialk II Pardis	Red	Red		*	11.39, 9.59	7005
P2h	Sialk II Pardis	Red	Buff		*	8.65, 6.555	7017
P2g	Sialk II Pardis	Red	Red		*	6.90, 5.89	7005
P2d	Sialk II Pardis	Red	Red		*	3.99, 3.31	7006
P2b	Sialk II Pardis	Red	Red		*	7.58, 7.20	7007
P2f	Sialk II Pardis	Red	Buff		*	10.83, 8.25	7017

**Average values of 10 measurements*.

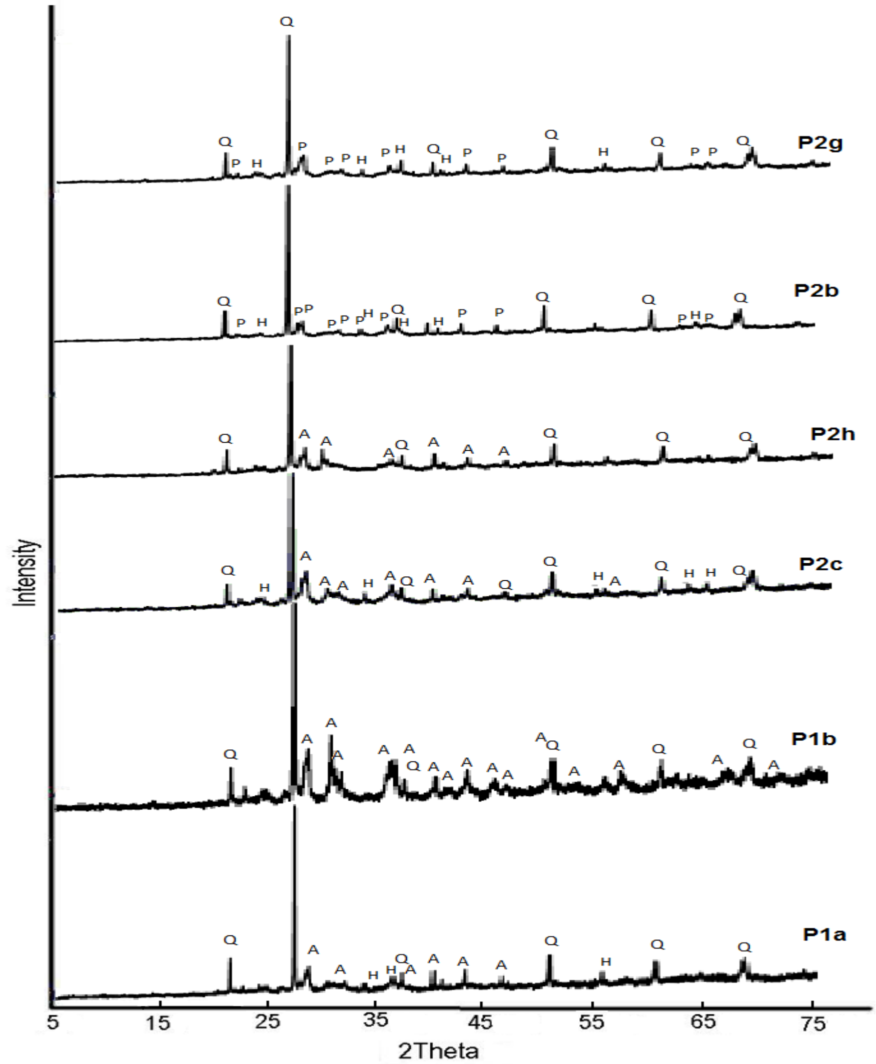


Figure 6.32 XRD traces of some typical pottery specimens of Pardis: Q = Quartz (01-0649), A = Augite (071-0721), H = Hematite (01-1053) and P=Orthopyroxene (086-0163).

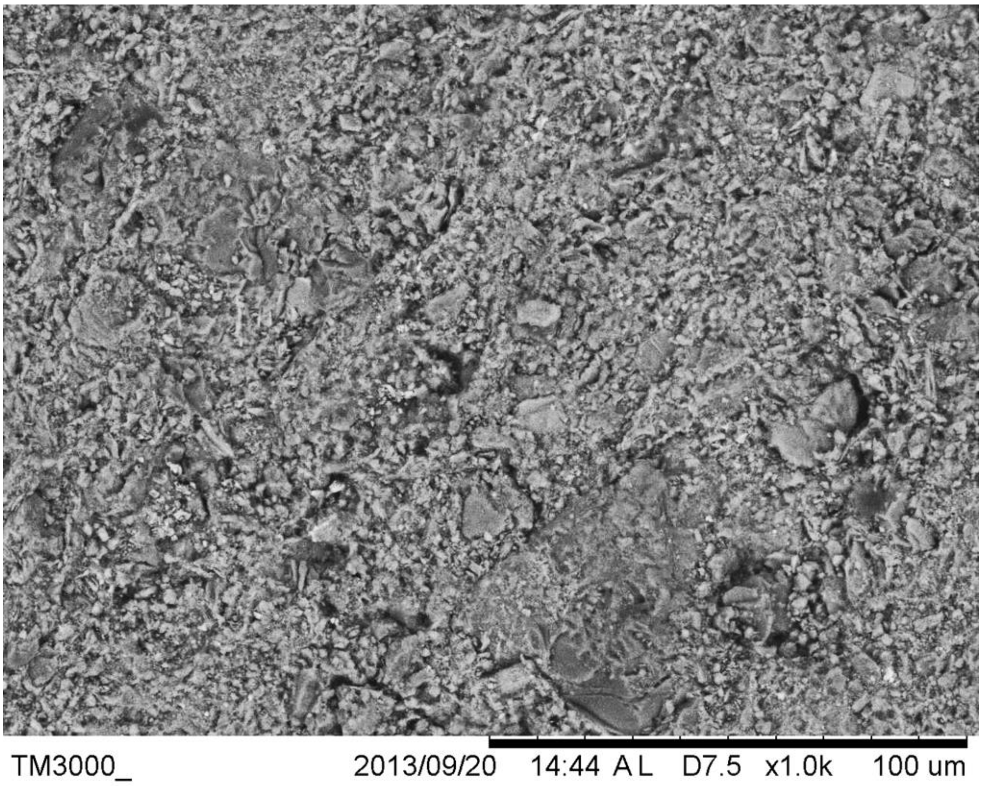


Figure 6.33 SEM microstructure of Sample P1d, core

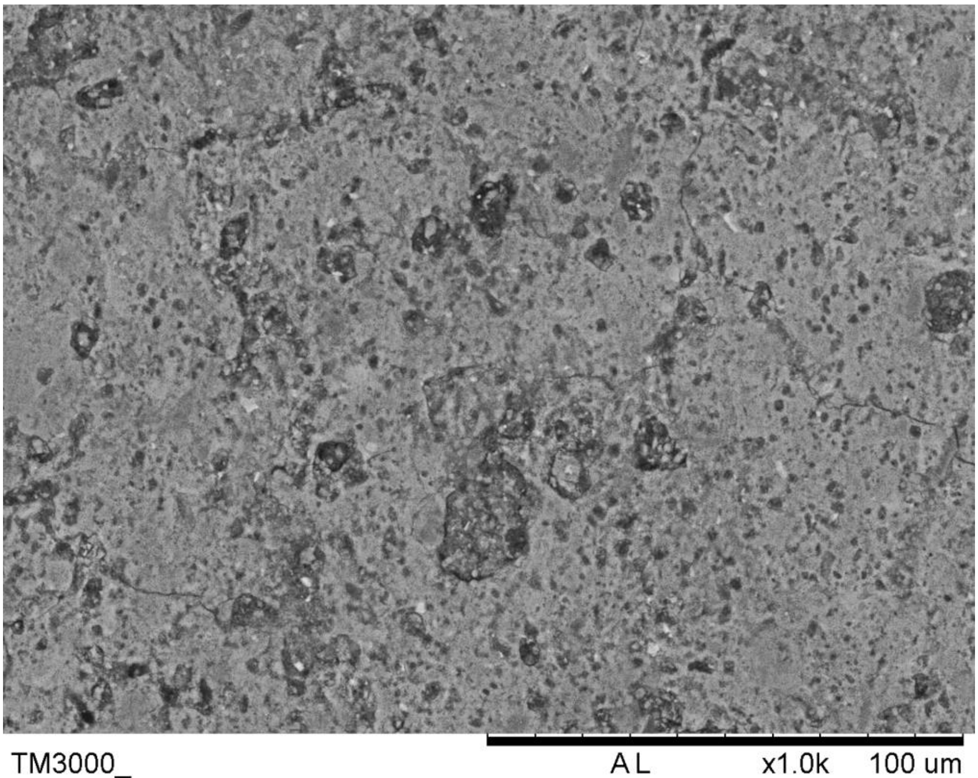


Figure 6.34 SEM microstructure of Sample P1e, exterior surface.

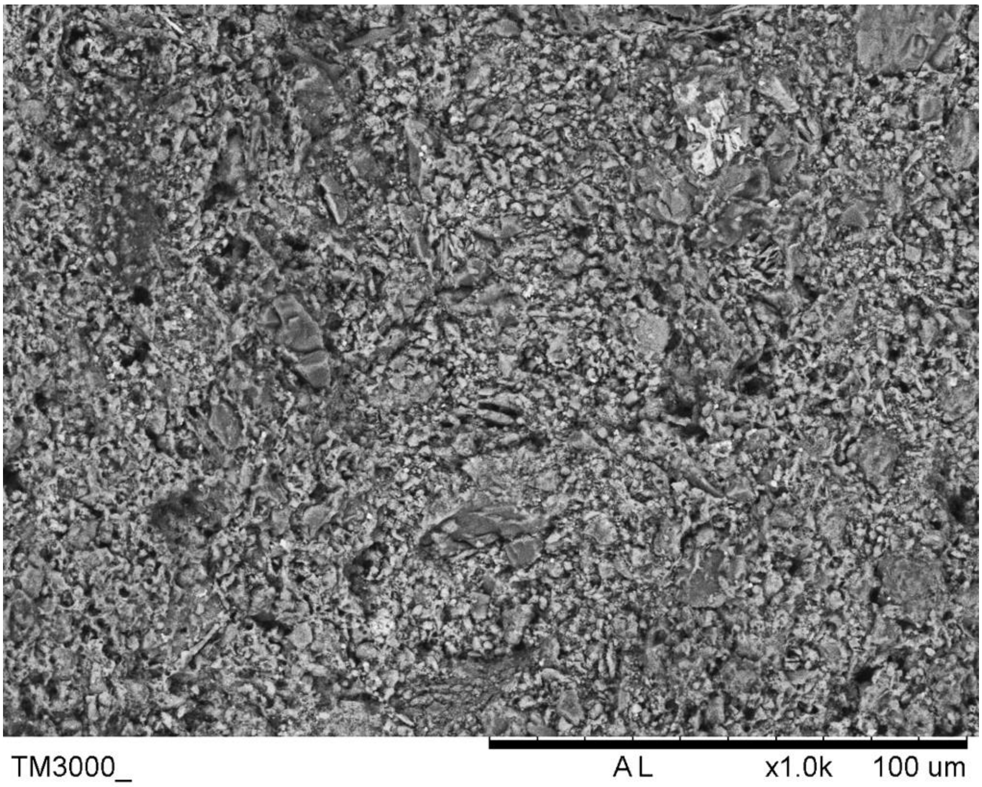


Figure 6.35 SEM microstructure of Sample P1f, core.

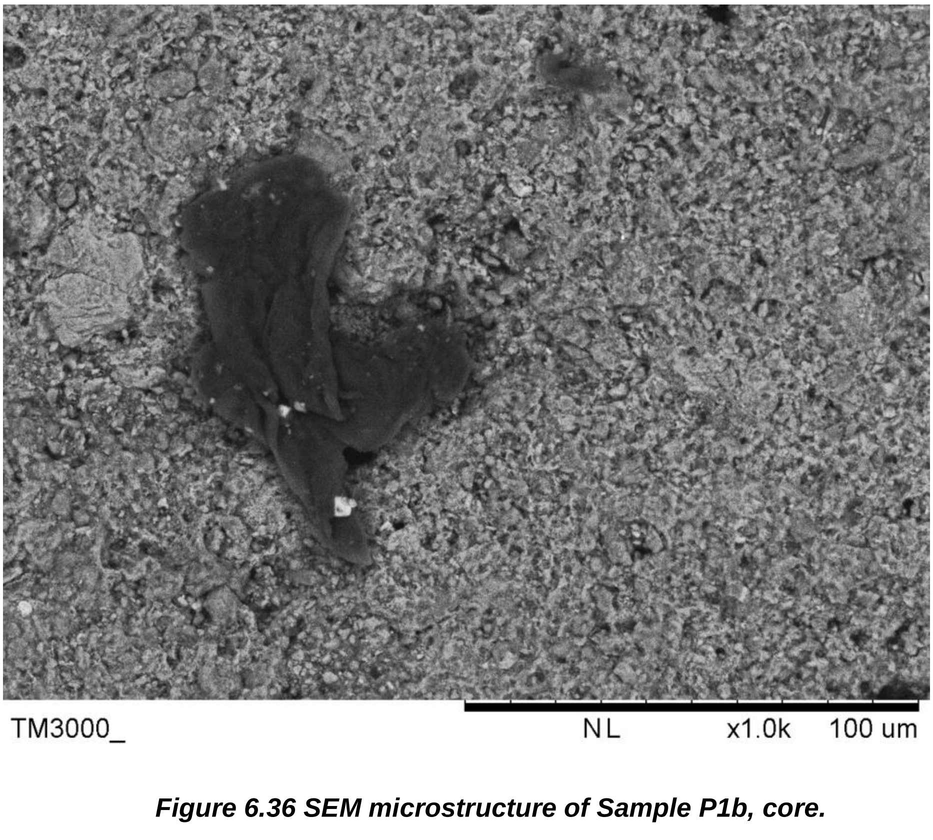


Figure 6.36 SEM microstructure of Sample P1b, core.

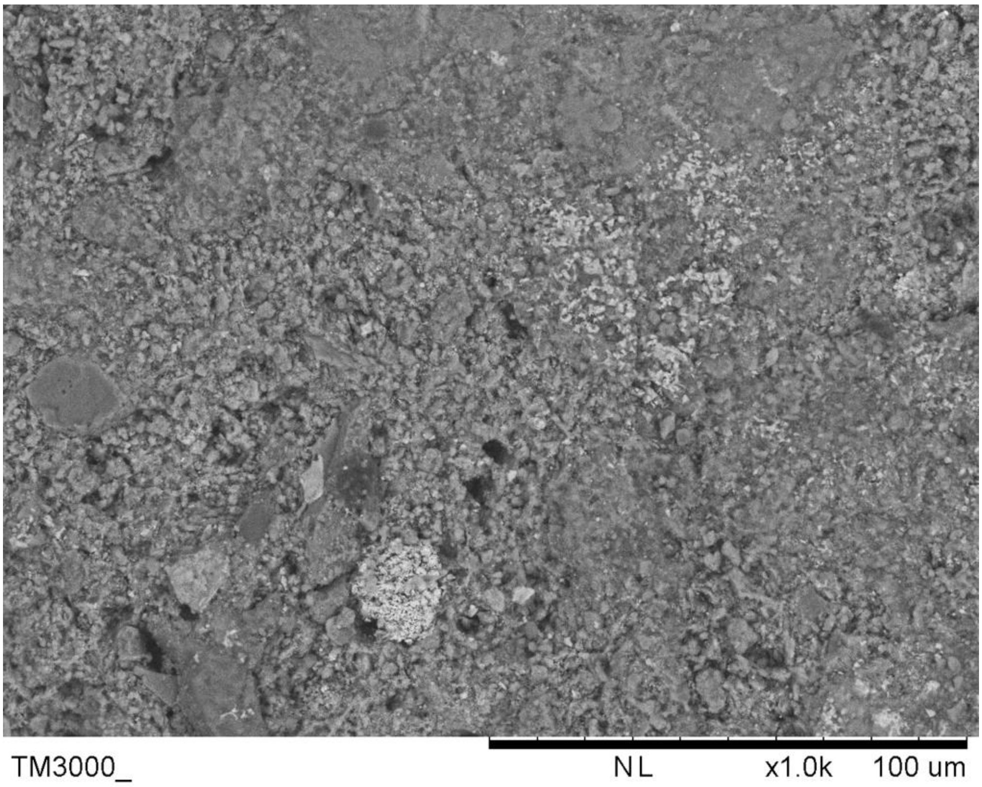


Figure 6.37 SEM microstructure of Sample P1g, exterior surface.

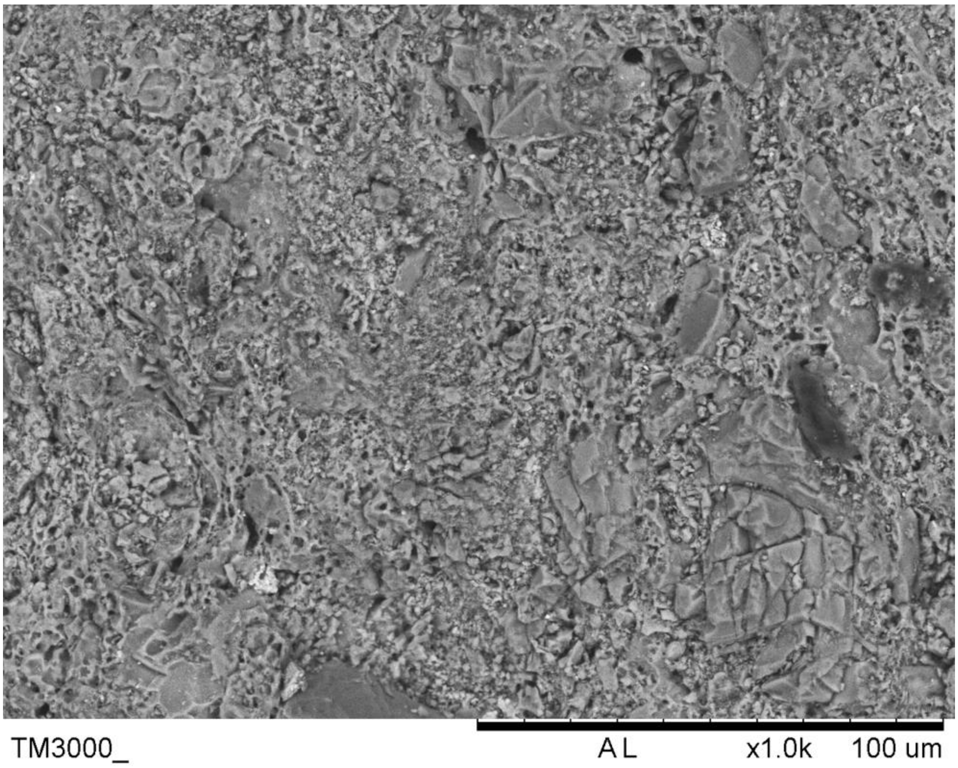


Figure 6.38 SEM microstructure of Sample P2b, core.

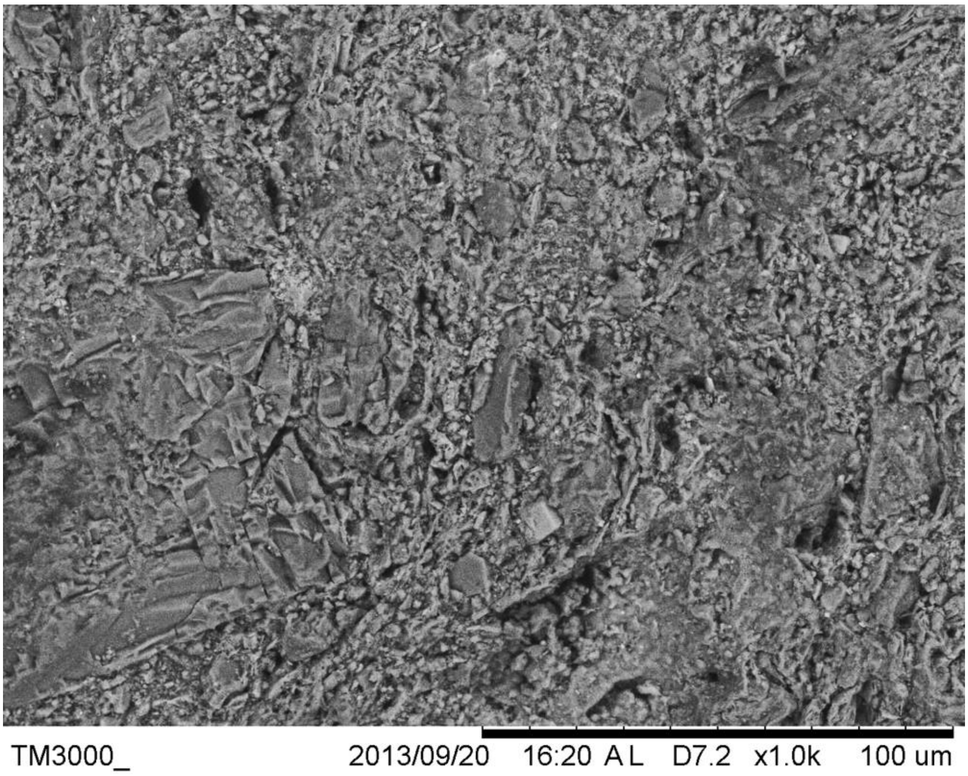


Figure 6.39 SEM microstructure of Sample P2a, core

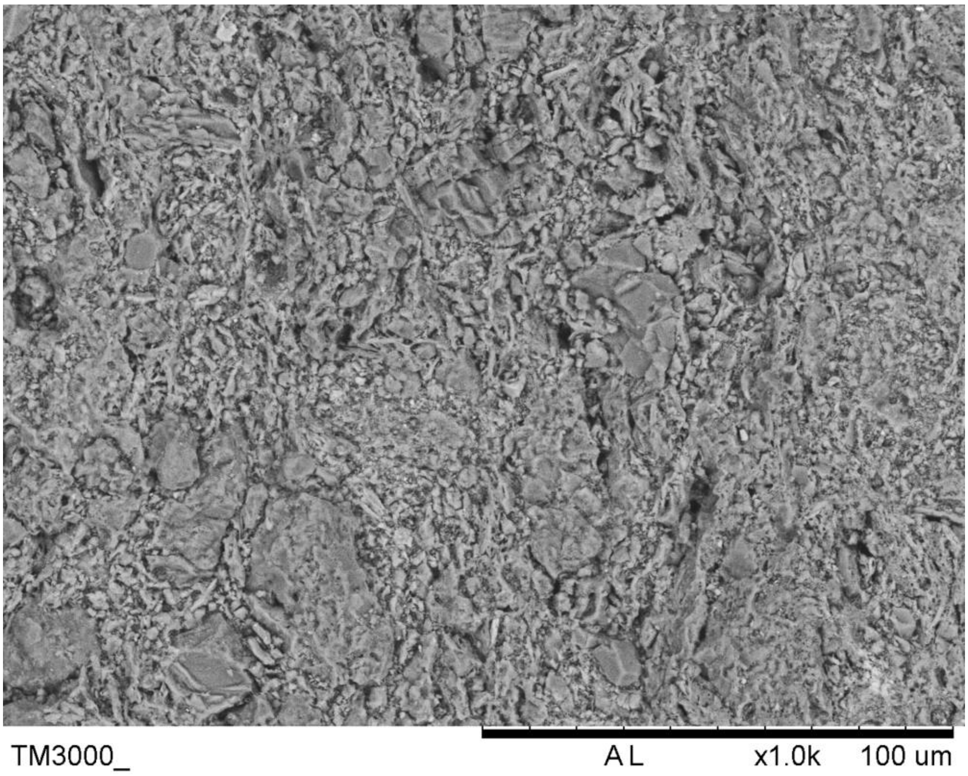


Figure 0.40 SEM microstructure of Sample P2g, core.

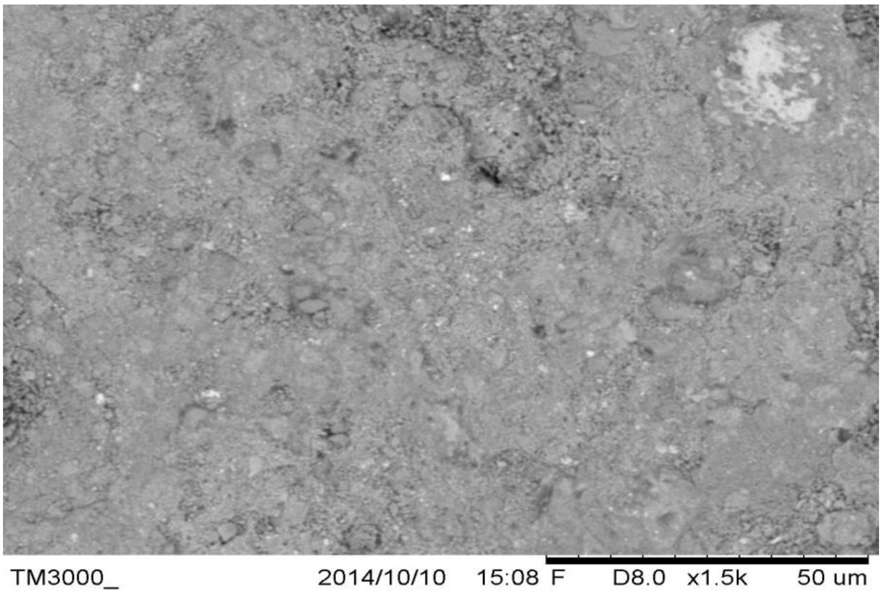
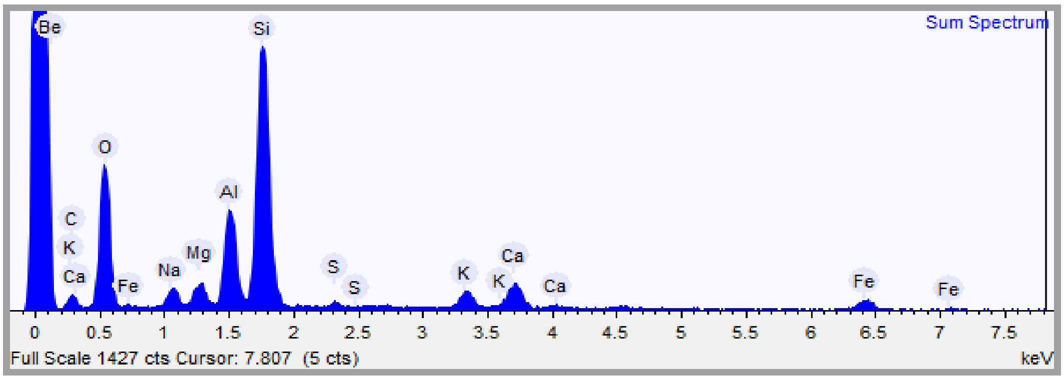


Figure 6.41 SEM microstructure of Sample P2e, exterior surface.

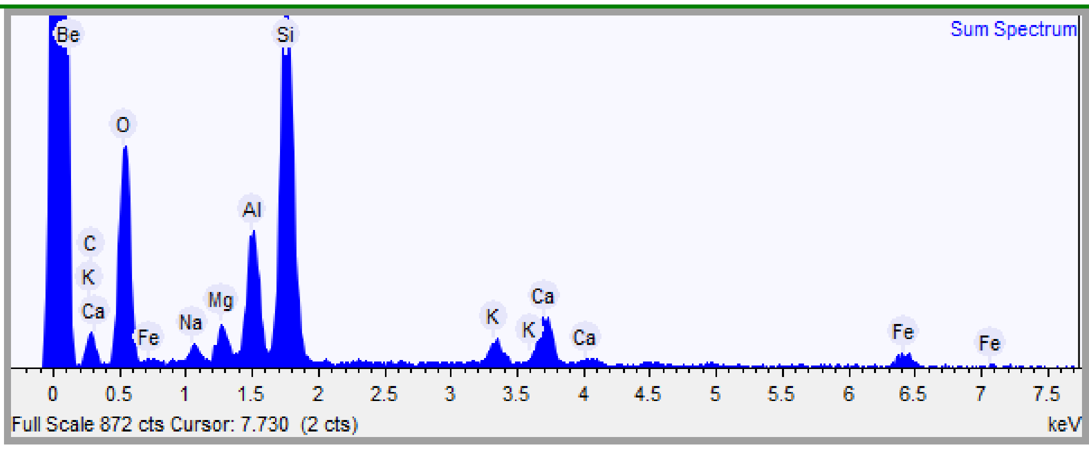


Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	6.874	5.113	11.365
Oxygen	46.995	2.661	58.328
Sodium	2.235	0.219	1.930
Magnesium	1.925	0.189	1.572
Aluminum	7.492	0.471	5.514
Silicon	22.762	1.310	16.093
Sulfur	0.582	0.117	0.360

(a)

Potassium	2.356	0.208	1.197
Calcium	3.720	0.284	1.843
Iron	5.058	0.467	1.799



Summary results

Element	Weight %	Weight % σ	Atomic %
Carbon	12.864	5.093	20.056
Oxygen	47.670	2.874	55.794
Sodium	1.225	0.182	0.998
Magnesium	1.767	0.192	1.361
Aluminum	6.034	0.420	4.187
Silicon	19.590	1.209	13.061
Potassium	1.934	0.199	0.926
Calcium	4.757	0.357	2.223
Iron	4.159	0.440	1.395

(b)

Figure 6.42 A typical elemental spectrum of the Sample P2c which is red both on exterior and core. (a) Exterior surface. (b) Core.

6.5 Conclusion

This chapter has presented the results of scientific analyses of selected sherds of the Late Neolithic and Transitional Chalcolithic periods from three prominent prehistoric sites located in Central Plateau of Iran, thus partly fulfilling the Objective Five of the thesis. The scientific analyses have been concentrated on the collection of data concerning the chemical-mineralogical composition as well as the microstructure of pottery utilising the methods of characterisation of materials, including the XRF, XRD, SEM/EDX techniques. The study of these data will help promote a better understanding of the development of pottery production techniques for each site and period and intimate the socio-economic changes occurring in the Central Plateau of Iran in Late Neolithic and Transitional Chalcolithic periods, as well as by providing a more reliable method for comparison of the pottery of different sites of the Central Plateau of Iran. They will contribute to shedding more light on the nature of the existing economic and cultural connections and interactions of the prehistoric communities living in this region in the specified time periods. The next chapter will be devoted to the discussion of the scientific data alongside the analysis of the form and decoration of pottery as obtained by the typological classification and phylogenetic reconstruction method in fulfilment of the Objectives Three, Four and Five.

Chapter 7: Discussion

7.1 Introduction

After the presentation of data analyses on the form and decoration of pottery in Chapter Five and the scientific analysis of pottery in Chapter Six, Chapter Seven will now develop a full discussion of the data as presented in the aforementioned two Chapters.

In this chapter, we will first discuss the results of typological analysis in order to determine the existence of different form type of pottery at each of the individual sites at different time periods but also to identify similarities and differences between them. The results of the application of phylogenetic techniques to the pottery assemblages from the three sites during the different time periods will then be discussed to illustrate similarities and differences between patterns of decorations. Finally, data collected from the scientific analyses of ceramic characterisation, such as chemical-mineralogical compositions and microstructure, will be discussed to illustrate details of the development of production techniques at each site and over time. These three analytical methods, in combination, will be used to gain a better understanding of the evolutionary history of the Central Plateau's pottery-making industry and their implications for the socio-economic changes occurring in the Late Neolithic and Transitional Chalcolithic periods. The comparison of form, decoration and production techniques at different locations and different time periods may also allow us to identify the existence of the cultural exchange or long distance trade across the Central Plateau covered by this study, thus serving to meet Objectives 3, 4 and 5.

7.2 Discussion of the results of typology

The purpose of this section is to ascertain the existence of various form type of pottery at each of the individual sites under study during different time periods. The analysis of data, as noted above, has the possibility to demonstrate the existence of exchange and long distance trade of wares across the Central Plateau.

Base form types

The assemblage from the three sites contained 235 base forms, which were classified in seven different types as recorded in Table 7.1. The description of an assembly of the three sites' pottery has also been shown on Chapter Five and Table 5.1 illustrated the selective drawings of ceramics forms. Each base form was also offered a description, associated class, estimated diameter and weight, the details of which are reported in Tables 5.2-5.4.

Table 7.1 Vessel base form types and their numbers in Tepe Sialk, Pardis and Ebrahimabad.

Type	R1	R2	R3	R4	F1	F2	F3	Total
Vessel type	Base	Base	Base	Base	Base	Base	Base	
Number of Sialk I*	0	4	3	7	13	16	10	53
Number of Sialk II	0	5	3	0	4	6	9	27
Number of Pardis I	0	0	0	0	0	0	0	0
Number of Pardis II	19	26	4	34	11	0	8	102
Number of EB. I	0	4	0	7	6	2	5	24
Number of EB. II	0	6	0	3	8	3	9	29
Total	19	45	10	51	42	27	41	235

*. I and II denote the periods.

Due to the relatively limited number of certain base form type recovered from some sites and periods, it is not possible to carry out valid discussions or draw definite and concrete conclusions regarding the distribution pattern of the base forms among the sites and periods.

Rim form types

The assemblages from the three sites within the Central Plateau of Iran also contained 1085 rims belonging to 26 different rim type (Table 7.2). Each rim type has again been categorised according to its description, associated class and estimated diameter and weight (Tables 5.2-5.4), while Table 5.1 illustrated the selective drawings of ceramics.

The analysis of the assemblages has been concentrated on the breakdown of each assemblage into various types, giving a generalised overview of any possible trade and exchange patterns. Figure 7.1 depicts the rim type breakdown graph, encompassing all studied rims from Sialk, Pardis and Ebrahimabad during the Transitional Chalcolithic and Late Neolithic periods.

Table 7.2 The type of all Pottery rims breakdown in Sialk, Pardis and Ebrahimabad.

Type	J1a	J1b	J1c	J2	B1a	B1b	B1c	B1d	B1e	B2a	B2b	B2c	B3a	B3b	B3c	B3d	B3e	B4a	B4b	B5	B6	T1	T2	T3	D1	BE1	Total
Vessel type	Jar	Jar	Jar	Jar	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Bowl	Tray	Tray	Tray	Dish	Beaker	
Number of Sialk I	2	3	0	11	2	4	3	4	8	6	34	0	57	126	18	84	6	17	8	51	0	7	0	3	0	0	434
Number of Sialk II	3	0	0	0	0	6	2	0	7	0	0	0	23	37	8	27	0	12	8	8	0	8	0	4	2	16	171
Number of Pardis I	0	0	3	0	0	0	0	0	0	0	3	0	0	4	2	0	0	0	0	0	0	0	0	0	4	0	16
Number of Pardis II	8	11	16	10	16	35	0	8	24	8	9	15	26	19	17	19	0	8	28	18	1	8	2	2	6	4	305
Number of EB. I	0	0	0	3	0	0	0	0	0	0	5	4	6	10	3	5	0	0	0	0	0	0	0	0	0	0	36
Number of EB. II	0	2	0	0	4	0	3	0	6	6	7	9	12	17	11	5	0	0	0	3	0	2	0	0	3	0	90
Total	13	16	19	24	22	45	8	12	45	20	58	28	124	213	59	140	6	37	44	80	1	25	2	9	15	20	1085
(%)	1.2	1.5	1.7	2.2	2	4.1	0.7	1	4	1.8	5.5	2.5	11	20	5.5	13	0.5	3.4	4	7.4	-	2.3	-	0.8	1.4	1.8	

*. I and II denote the periods.

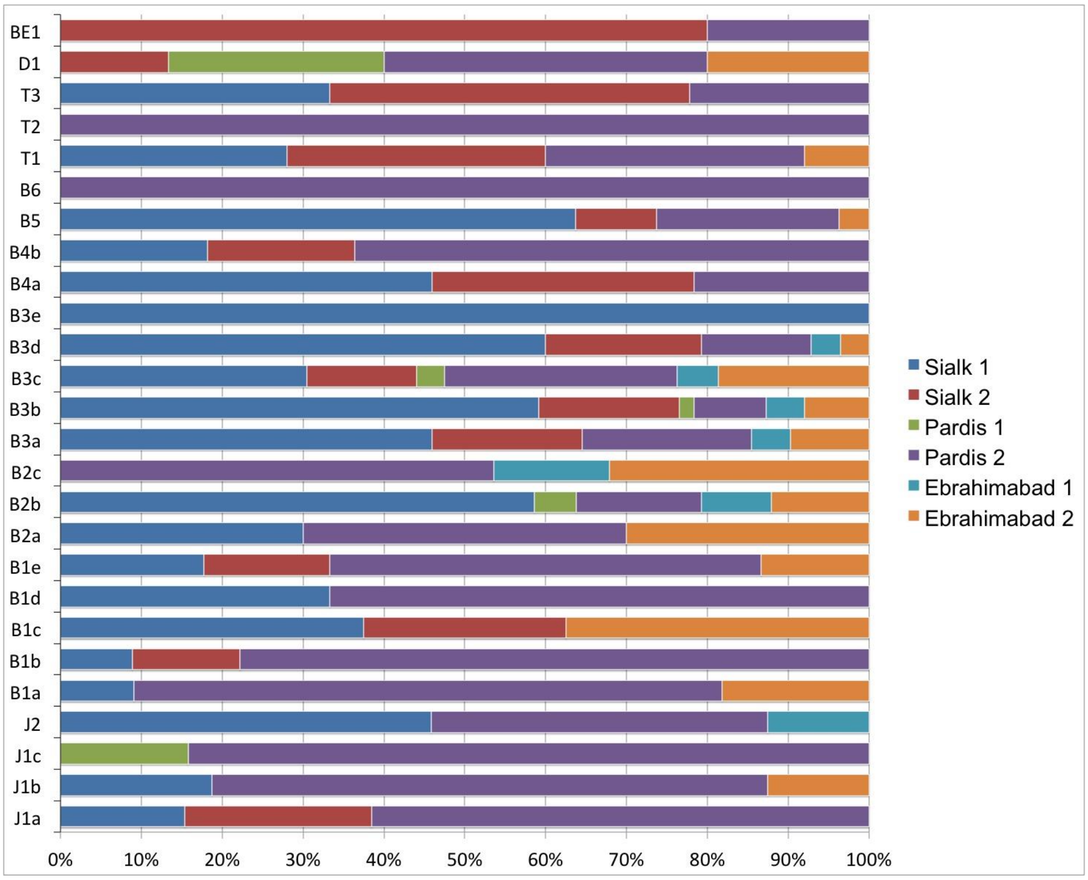


Figure 7.1 The rim type breakdown graph for all the three sites in the Transitional Chalcolithic and Late Neolithic periods.

It can be seen that rim type T2 and B6 are exclusive to Pardis II and B3e type to Sialk I pottery, whilst all other type are common between sites and periods. Figures 7.2-7.4 further depict the separate rim forms breakdown graphs for each of the three sites respectively, encompassing both the Transitional Chalcolithic and Late Neolithic pottery.

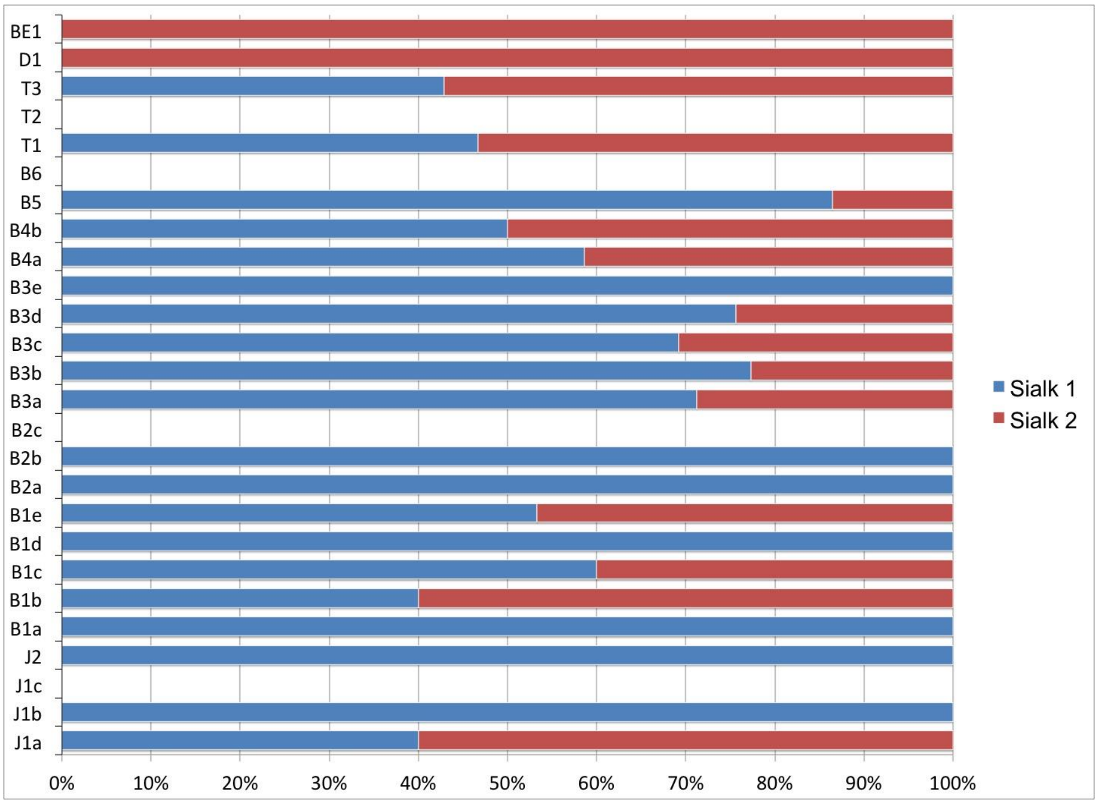


Figure 7.2 Sialk's Rim vessel forms breakdown graph.

Figure 7.2 indicates that of the rim forms of pottery found at Sialk, the rim forms attributed to the vessels J1b, J2, B1a, B1d, B2a, B2b, B3e are specific to Sialk I and forms D1 and BE1 are specific to Sialk II, whilst other forms are common between Sialk I and Sialk II.

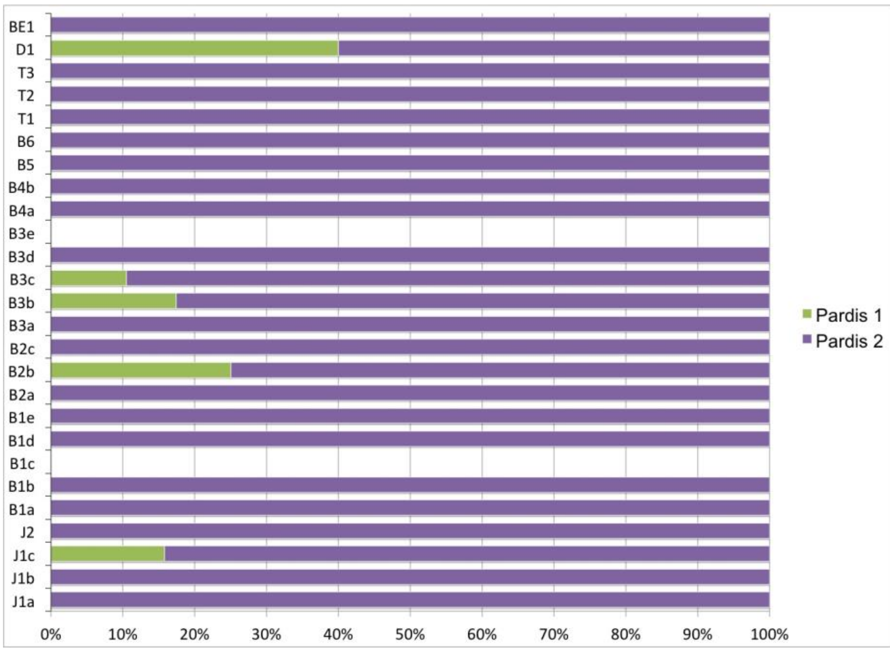


Figure 7.3 Pardis' Rim forms breakdown graph.

Figure 7.3 indicates that of all the forms recovered from Pardis, the rim forms attributed to the vessels J1c, B2b, B3b, B3c, and D1 are common between the Sialk I and Sialk II type of pottery in Pardis, whilst the other forms are specific to Sialk II type of pottery in this site.

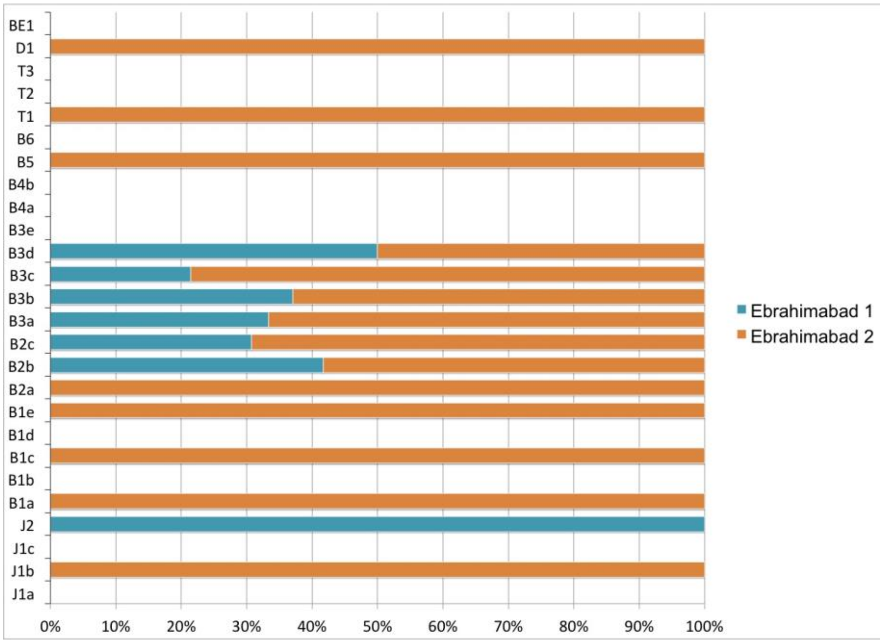
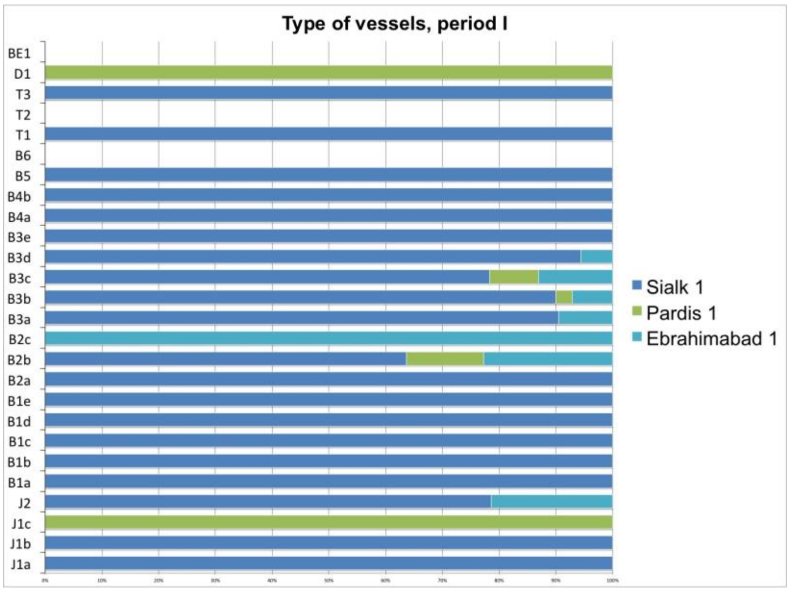
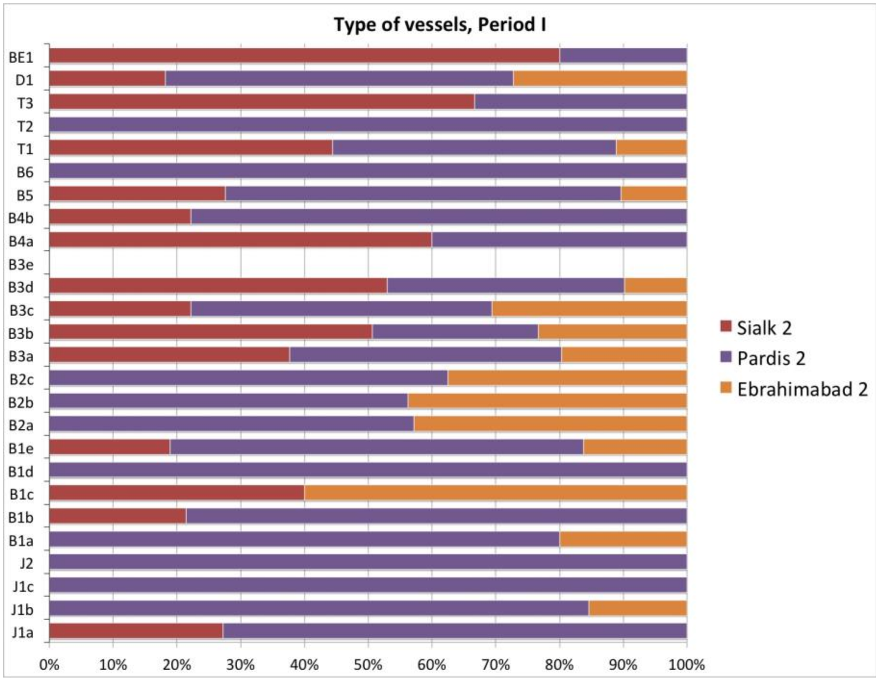


Figure 7.4 Ebrahimabad's rim pottery form type breakdown graph.

Figure 7.4 shows that among all the rim forms of pottery recovered from Ebrahimabad, the rim forms attributed to the vessels, J1b, B1a, B1c, B1e, B2a, B5, T1 and D1 are specific to Transitional Chalcolithic (Sialk II type) and J2 is specific to Late Neolithic (Sialk I type) in this site, whilst other forms are common between these periods. Figures 7.5a and 7.5b demonstrate the vessel type of the three sites during the Late Neolithic and Transitional Chalcolithic periods, respectively.



a)



b)

Figure 7.5 a) Vessel type breakdown graph in the Late Neolithic period. b) Vessel type' breakdown graph in Transitional Chalcolithic period.

As can be seen in the Tables, form BE1, a beaker with a steep and vertical straight shoulder (75˚ to near vertical angle) leading to a Flat-bottomed base, is exclusive to the Sialk II and Pardis II. Forms B6, a closed bowl with a steep shoulder and globular body leading to a narrow pedestal base, and T2, a tray bowl with a vertical wall rising to slightly flattened and rounded rim, are excusive to Pardis II. However, Form B3e, an open Bowl with a rounded and flared rim inwardly sloped (45-75˚ angle) and a curved neck leading to a Flat-bottomed base), is exclusive to Sialk I. Figures 7.6 and 7.7 show the relative quantity of the vessel type in the Late Neolithic and Transitional Chalcolithic periods.

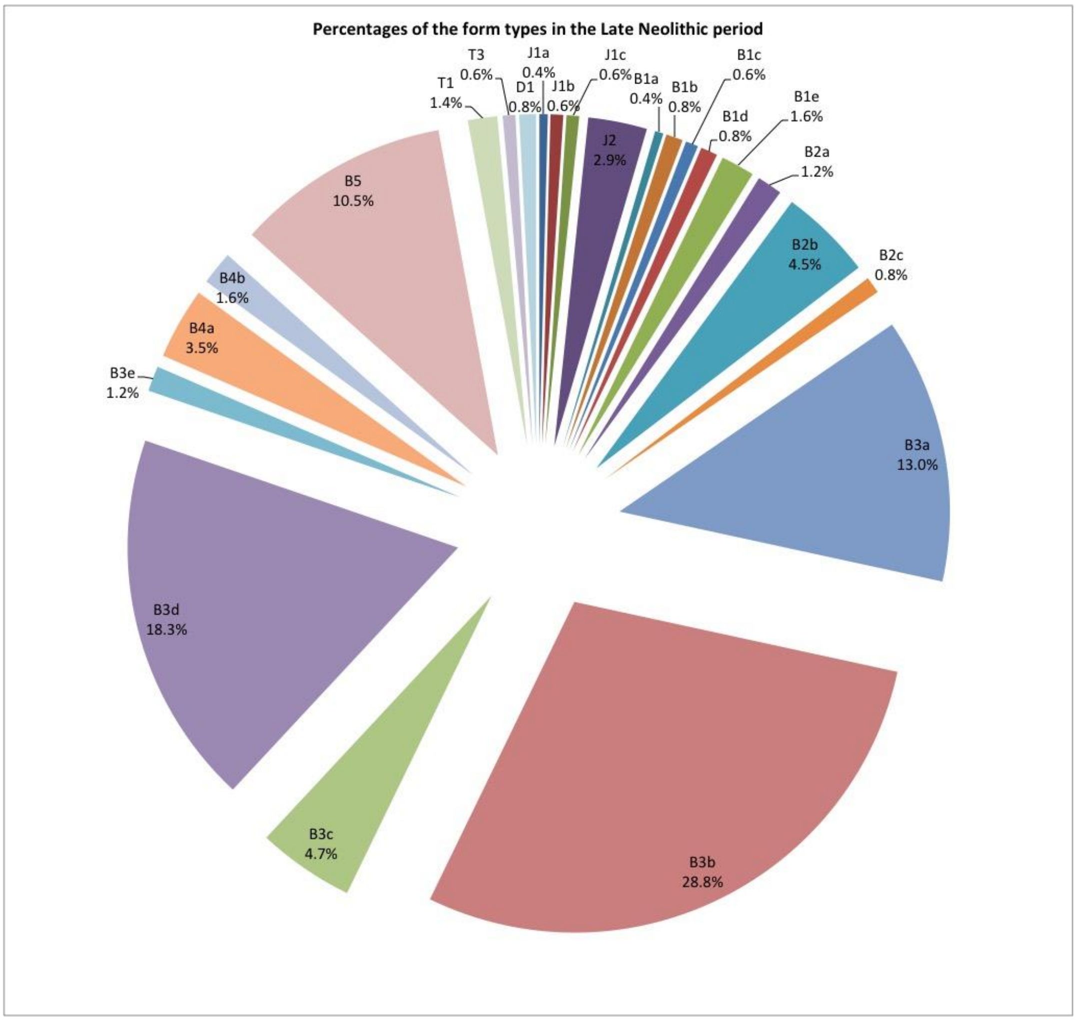


Figure 7.6 Relative quantity of the vessel type in the Late Neolithic period.

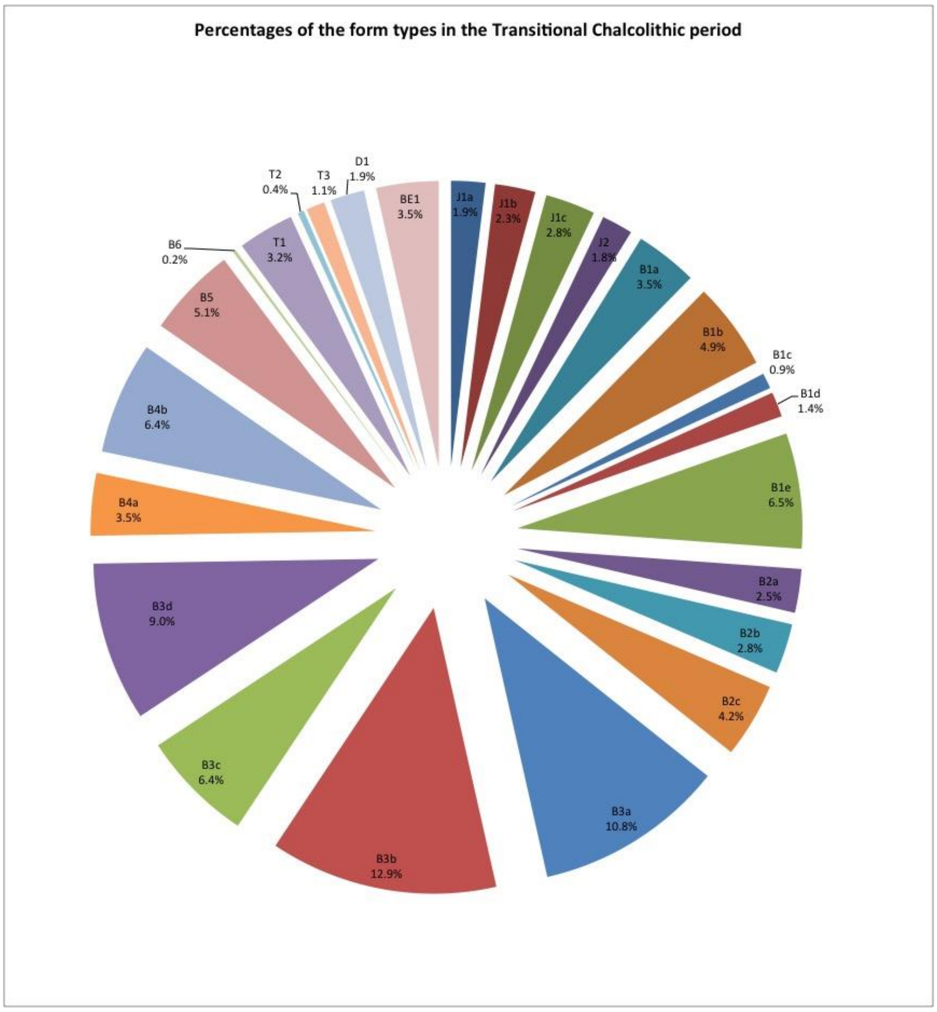


Figure 7.7 Relative quantity of the vessel type in the Transitional Chalcolithic period.

These figures reveal that type B3b has the highest percentage of rim type in the Late Neolithic, with 28.8 % of all sherds found in this period, and also the highest percentage of rim type in the Transitional Chalcolithic, with 12.9 % of all sherds found in the latter period. Figures 7.8 and 7.9 compare graphically the relative abundance and variability of pottery sherds found in the various sites and periods.

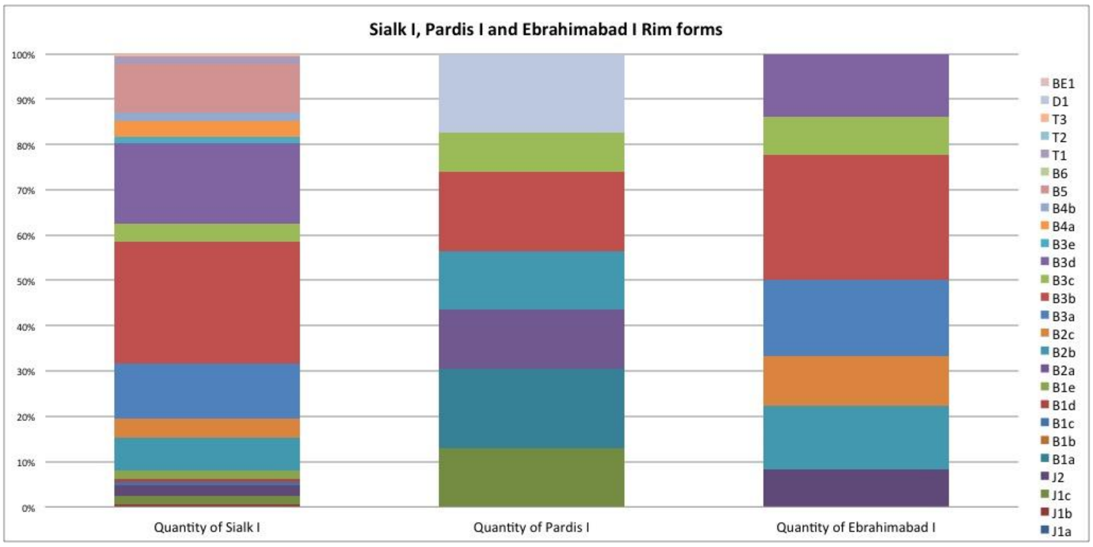


Figure 7.8 Relative quantity of rim type in the late Neolithic period

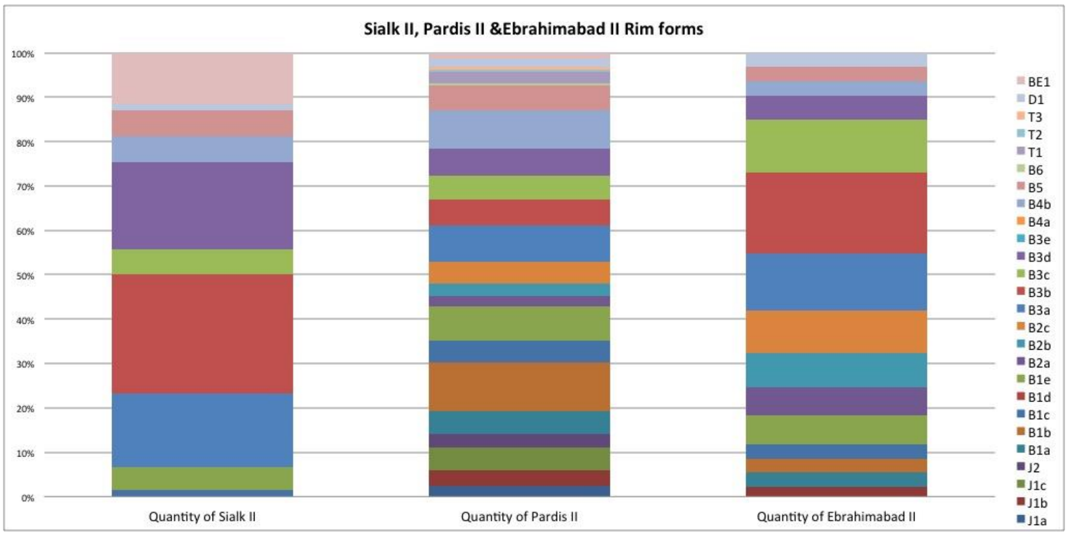


Figure 7.9 Relative quantity of rim type in the Transitional Chalcolithic period.

It can be seen that in the late Neolithic period the most variety of rim forms come from Sialk, and the rim form B3b is the most common form for both Ebrahimabad and Sialk's assemblages, whereas for the Transitional Chalcolithic period the most variety of rim forms come from Pardis and the majority of the rim forms both in Ebrahimabad and Sialk's assemblages belong again to the B3b rim form.

Tables 7.2-7.4 depict the common rim type between all the sites and periods.

Table 7.3 Common form type between two periods in the each site (green for Sialk, purple for Pardis and blue for Ebrahimabad)

Type	Quantity of Sialk I	Quantity of Sialk II	Quantity of Pardis I	Quantity of Pardis II	Quantity of EB I	Quantity of EB II	Total
J1a	2	3	0	8	0	0	13
J1b	3	0	0	11	0	2	16
J1c	0	0	3	16	0	0	19
J2	11	0	0	10	3	0	24
B1a	2	0	0	16	0	4	22
B1b	4	6	0	35	0	0	45
B1c	3	2	0	0	0	3	8
B1d	4	0	0	8	0	0	12
B1e	8	7	0	24	0	6	45
B2a	6	0	0	8	0	6	20
B2b	14	0	3	9	5	7	38
B2c	0	0	0	15	4	9	28
B3a	57	23	0	26	6	12	124
B3b	126	37	4	19	10	17	213
B3c	18	8	2	17	3	11	59
B3d	84	27	0	19	5	5	140
B3e	6	0	0	0	0	0	6
B4a	17	12	0	8	0	0	37
B4b	8	8	0	28	0	0	44
B5	51	8	0	18	0	3	80
B6	0	0	0	1	0	0	1
T1	7	8	0	8	0	2	25
T2	0	0	0	2	0	0	2
T3	3	4	0	2	0	0	9
D1	0	2	4	6	0	3	15
BE1	0	16	0	4	0	0	20

On the basis of the results of Table 7.2 depicting the common form types between two periods in the each site for the pottery collections of the three sites, following conclusions can be drawn:

1 Sialk I and II type pottery sherds from Sialk have 13 pottery forms in common (Figure 7.10).

2. Sialk I and II type pottery sherds from Ebrahimabad have 6 pottery forms in common (Figure 7.11).

3. Sialk I and II type pottery sherds from Pardis have 5 pottery forms in common Figure 7.12).

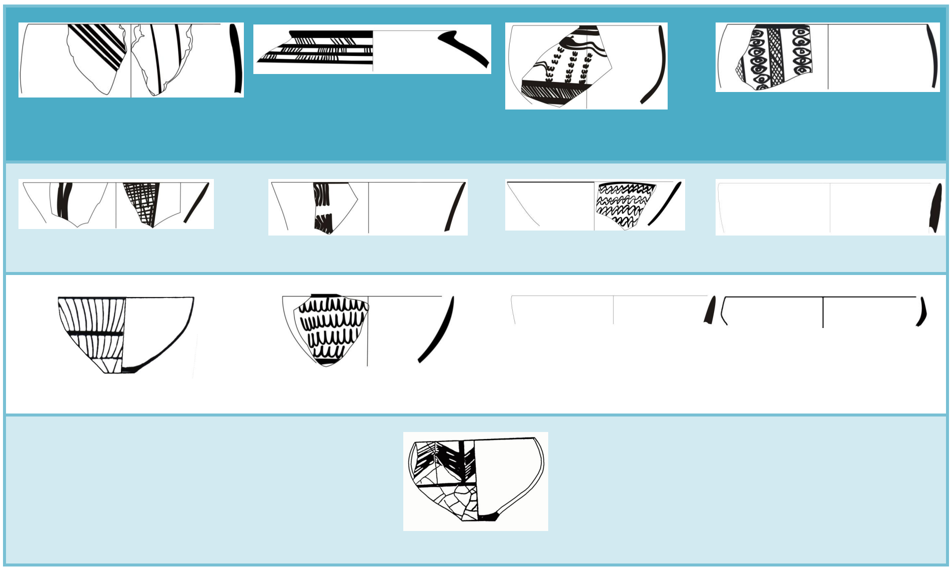


Figure 7.10 Common form type shared between the Late Neolithic and Transitional Chalcolithic period in Sialk.

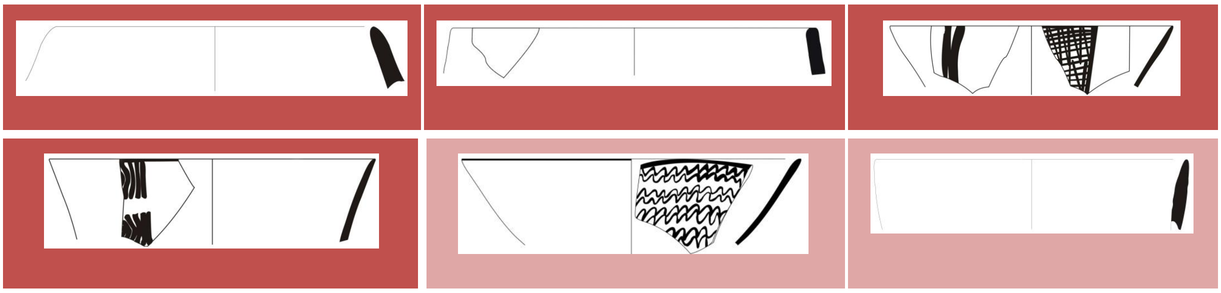


Figure 7.11 Common form type shared between the Late Neolithic and Transitional Chalcolithic period in Ebrahimabad.

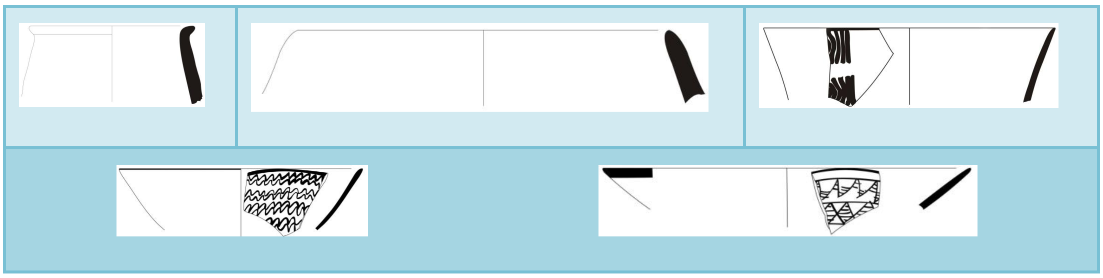


Figure 7.12 Common form type shared between the Late Neolithic and Transitional Chalcolithic period in Pardis.

Table 7.4 Common form type shared between the sites in the Late Neolithic period (blue for Sialk and Ebrahimabad and yellow for common type in the all three sites).

Type	Quantity of Sialk I	Quantity of Pardis I	Quantity of EB I	Total
J1a	2	0	0	2
J1b	3	0	0	3
J1c	0	3	0	3
J2	11	0	3	14
B1a	2	0	0	2
B1b	4	0	0	4
B1c	3	0	0	3
B1d	4	0	0	4
B1e	8	0	0	8
B2a	6	0	0	6
B2b	34	3	5	42
B2c	0	0	4	4
B3a	57	0	6	63
B3b	126	4	10	140
B3c	18	2	3	23
B3d	84	0	5	89
B3e	6	0	0	6
B4a	17	0	0	17
B4b	8	0	0	8
B5	51	0	0	51
B6	0	0	0	0
T1	7	0	0	7
T2	0	0	0	0
T3	3	0	0	3
D1	0	4	0	4
BE1	0	0	0	0

On the basis of the results shown in Table 7.3 which depicts common form types shared between Sialk I type pottery sherds recovered from the three sites, the following conclusions can be drawn:

1. There are 3 common form types shared between all three sites.

2. Pottery sherds from Sialk and Ebrahimabad have 3 forms in common, while each of the aforementioned pottery sherds does not share any form solely with Pardis (Figure 7.13).

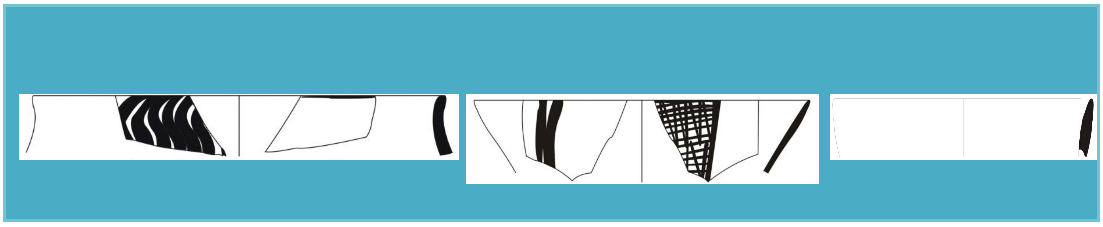


Figure 7.13 Common form type shared between Sialk and Ebrahimabad in the Late Neolithic period.

Table 7.5 Common form type shared between the sites in the Transitional Chalcolithic period (green for Sialk and Pardis, purple for Pardis and Ebrahimabad, blue for Sialk and and Ebrahimabad yellow for common type between the all three sites).

Type	Quantity of Sialk II	Quantity of Pardis II	Quantity of Ebrahimabad II	Total
J1a	3	8	0	11
J1b	0	11	2	13
J1c	0	16	0	16
J2	0	10	0	10
B1a	0	16	4	20
B1b	6	35	0	41
B1c	2	0	3	5
B1d	0	8	0	8
B1e	7	24	6	37
B2a	0	8	6	14
B2b	0	9	7	16
B2c	0	15	9	24
B3a	23	26	12	61
B3b	37	19	17	73
B3c	8	17	11	36
B3d	27	19	5	51
B3e	0	0	0	0
B4a	12	8	0	20
B4b	8	28	0	36
B5	8	18	3	29
B6	0	1	0	1
T1	8	8	2	18
T2	0	2	0	2
T3	4	2	0	6
D1	2	6	3	11
BE1	16	4	0	20

On the basis of the results shown on Table 7.4 illustrating common form types shared between Sialk II type pottery sherds from the three sites, the following conclusions can be drawn:

1. There are 8 common form types shared between all three sites.

2. Pottery sherds from Sialk and Ebrahimabad have only 1 common form with each other, while each of them shared 6 and 5 common forms, respectively with Pardis (Figures 7.14-7.16).

Figure 7.14 Common form type shared between Sialk and Ebrahimabad in the Transitional Chalcolithic period.

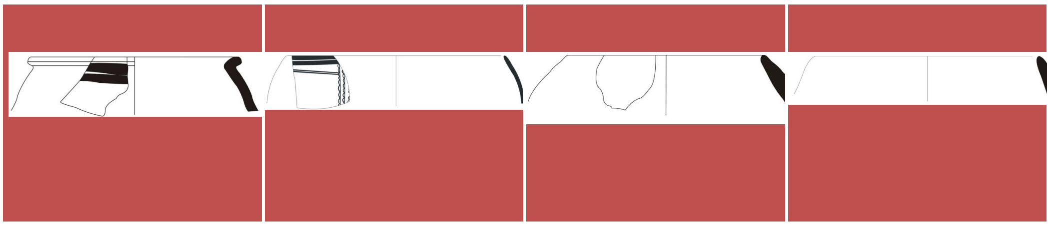


Figure 7.15 Common form type shared between Ebrahimabad and Pardis in the Transitional Chalcolithic period.

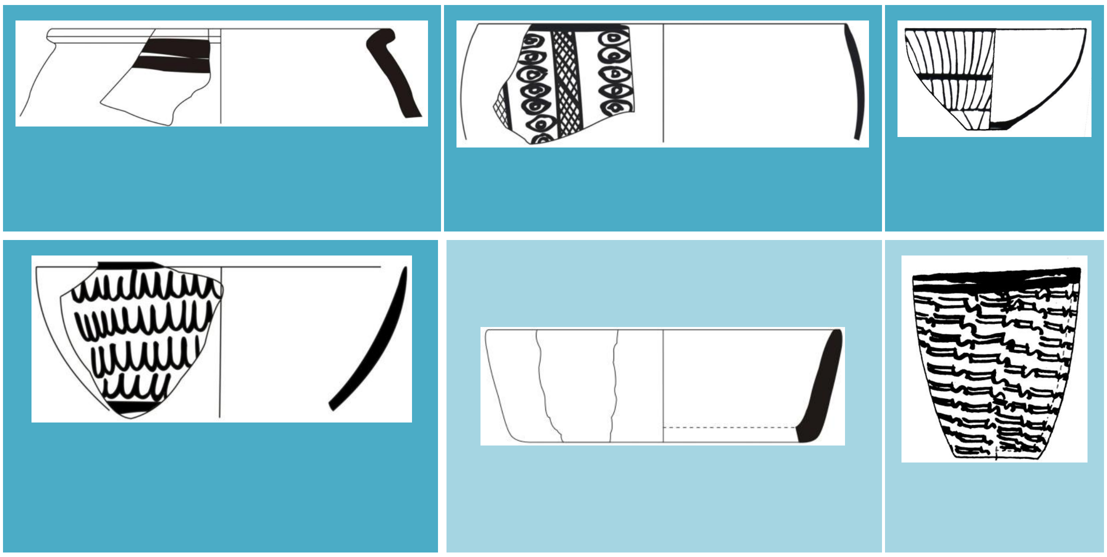


Figure 7.16 Common form type shared between Sialk and Pardis in the Transitional Chalcolithic period.

Tables 7.6-7.8 summarise the above results.

Table 7.6 Total number of rim forms of the Sialk I and II type of pottery in each site and the similarities between them.

Site	Total number of rim forms of Sialk I type	Total number of rim forms of Sialk II type	Total number of common rim forms between Sialk I and II type
Sialk	20	15	13
Ebrahimabad	7	14	6
Pardis	5	24	5

Table 7.7 Total number of rim forms in each site/Period and the similarities between them.

Site/Period	Total number of rim forms	Total number of common rim forms with Sialk	Total number of common rim forms with Ebrahimabad	Total number of common rim forms with Pardis
Sialk/ Sialk I	20	_	6	3
Ebrahimabad I	7	6	_	3
Pardis I	5	3	3	_
Site/Period	Total number of rim forms	Total number of common rim forms with SialkII	Total number of common rim forms with Ebrahimabad II	Total number of common rim forms with Pardis II
Sialk/ Sialk II	15	_	5	14
Ebrahimabad II	14	5	_	13
Pardis II	19	14	13	_

Table 7.8 Quantity of the most abundant, common rim forms in each site/Period.

Vessel Type	B3a	B3b	B3c	B3d	B5
Quantity of Sialk site Period I	13.1%	29%	4.84%	19.35%	11.75%
Quantity of Sialk site Period II	13.4%	21.6%	4.97%	15.8%	5.1%

Quantity of Pardis site Period I	-	25%	12.5%	-	-
Quantity of Pardis site Period II	8.5%	6.22%	5.6%	6.22%	5.9%
Quantity of Ebrahimabad site Period I	16.6%	27.7%	8.3%	13.8%	-
Quantity of Ebrahimabad site Period II	13.3%	18.9%	12.2%	5.5%	-

Table 7.7 Shows that the most abundant, common rim forms across all sites and periods is form B3b.

7.2.1 Determination of the quantitative distribution of rim diameters of the vessel types.

In order to further clarify the degree of standardisation and specialisation of pottery-making at selected sites, the quantitative distribution of the sizes of selected common vessel forms at each site and period was attempted.

Pottery from Sialk site

Sialk I pottery

Figures 7.17-7.21 illustrates the distribution of rim diameters for vessel types B3a, B3b, B3c, B3d and B5 belonging to Sialk I period.

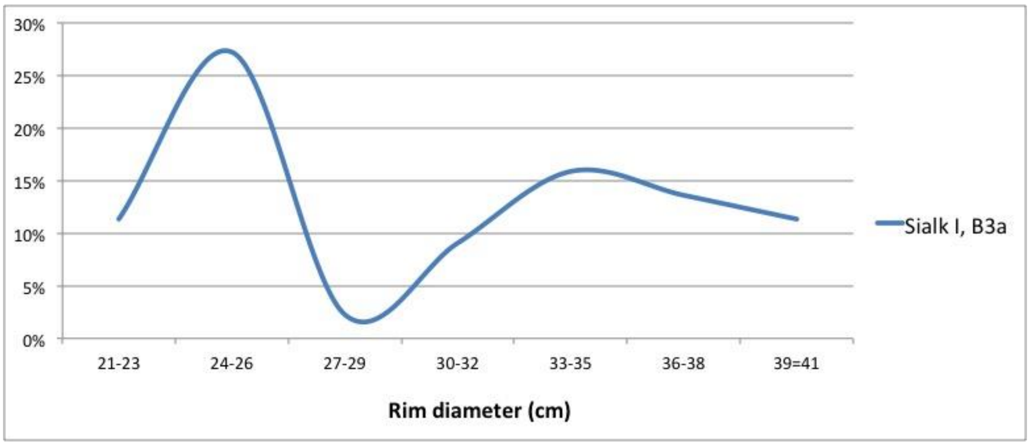


Figure 7.17 Distribution of rim diameters of vessel type B3a for Sialk I period.

Vessel B3a is an open bowl with a shallow, inwardly sloped (45-75° angle) straight-sided body. As may be noted in Figure. 7.17, the rim sizes of this Sialk I type exhibit a bimodal distribution with two very distinct peaks (local maxima). The first peak, which is higher and narrower (sharper), shows that the bowl diameters varies in a restricted range of approximately 24-26 centimetres, indicating that the greater number of produced small bowls are located in this range. The second quite broad and shorter peak reveals the existence of larger bowls with a more varied diameter range of > approximately 30 centimetres, peaking at approximately 33-35 centimetres, indicates that the potters of Sialk also produced relatively smaller numbers of larger bowls with a much broader range of sizes.

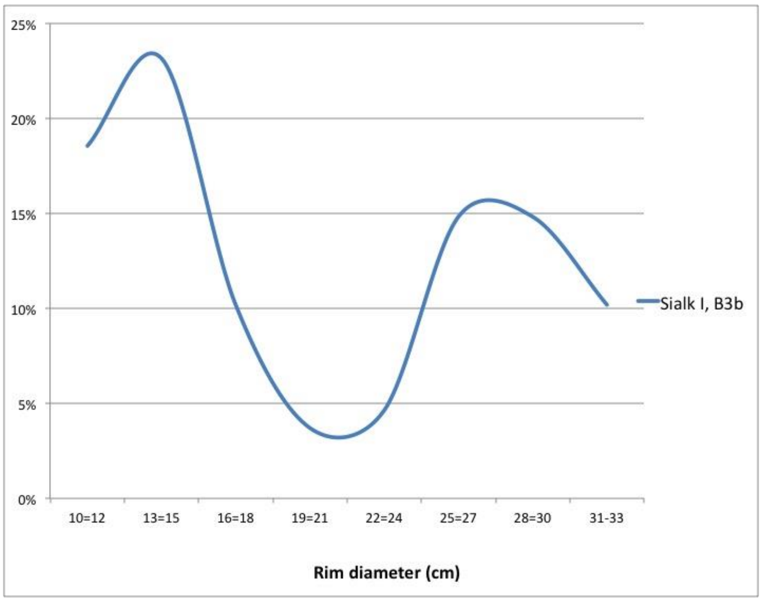


Figure 7.18 Distribution of rim diameters of vessel type* B3b *for Sialk I period.

Vessel B3b is an open bowl with a rounded and flared rim and a straight or slightly concave neck. The overall form and function of the vessels remains unclear although it is likely that they are storage jars. As may be apparent from Figure 7.18, the rim sizes of these Sialk I vessels exhibit a bimodal distribution with two very distinct peaks. The first peak, which is higher and sharper, shows that the diameters of smaller bowls varied in the range of approximately 10-18 centimetres, peaking at 13-15 centimetres. The second relatively broader and shorter peak reveals the existence of larger bowls within the range of 24-33 centimetres, of which most of them are in 25-27 centimetres range (peak of the range).

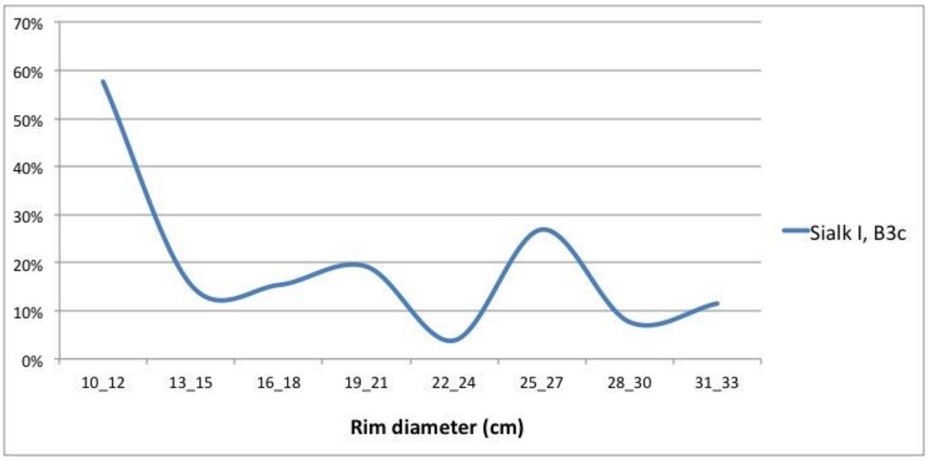


Figure 7.19 distribution of rim diameters of vessel type B3c for Sialk I period.

Vessel B3c is an open bowl with a shallow inwardly sloped, 45-75° angle, gently curving body. Figure 7.19 demonstrates that the rim size of these Sialk I vessels also exhibit a bimodal distribution with two distinct peaks.

The first peak is shorter and broader shows that the diameter of the small bowls of this type varied in a wide range between approximately 13-22 centimetres, peaking at ~ 19-21 centimetres. However, a greater number of very small bowls in the range of 10-12 centimetres were also produced. The second relatively sharper and higher peak reveals that the larger bowls within the restricted range of 25-27 centimetres were produced in larger quantities.

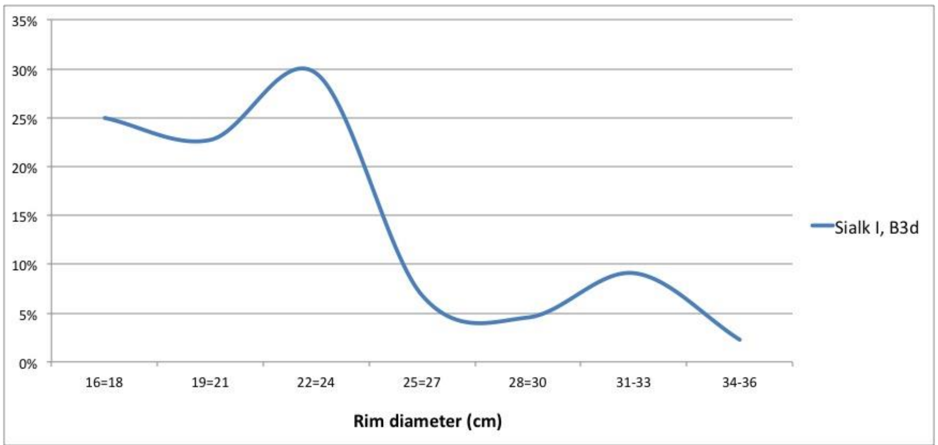


Figure 7.20 Distribution of rim diameters of vessel type B3d for Sialk I period.

B3d is an open bowl with a steep, straight shoulder, 75° to near 90 angle. Figure 7.20 shows that the rim sizes of these Sialk I vessels also exhibit a bimodal distribution with two very distinct peaks. The first peak is much higher and sharper and shows that the diameters of the most abundant small bowls varies in a restricted range of 22-24 centimetres, although some smaller bowls also were produced. The second much shorter and relatively broader peak reveals the existence of much larger bowls located within the rim range of 31-36 centimetres but were produced in considerably smaller numbers.

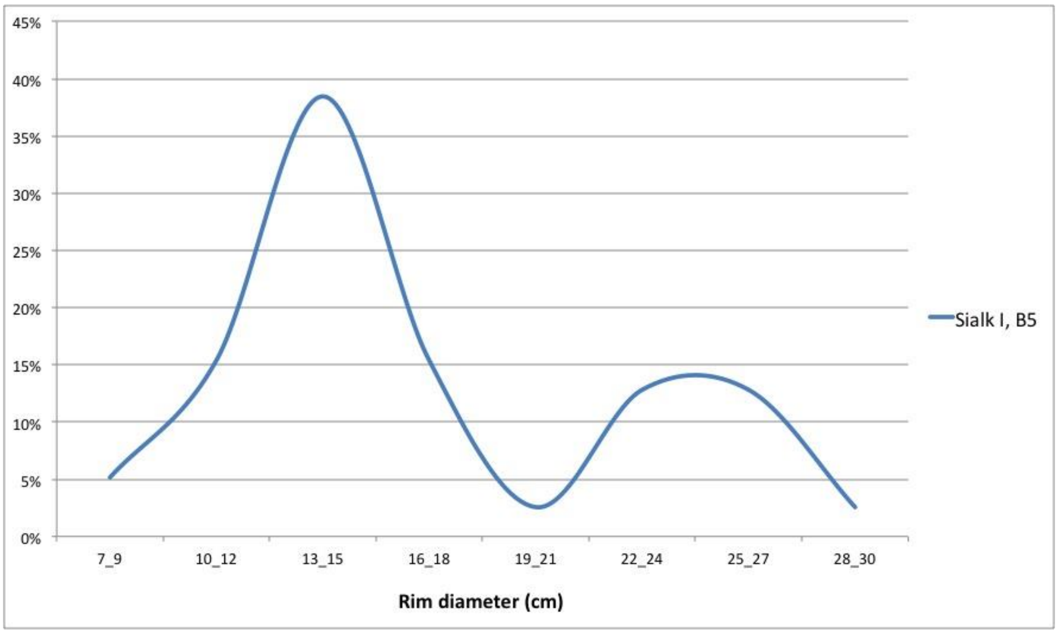


Figure 7.21 Distribution of rim diameters of vessel type B5 for Sialk I period.

B5 is an open bowl with a steep inwardly sloped, 75° to near vertical angle, straight-sided body. Figure 7.21 illustrates that the rim sizes of these Sialk I vessels also exhibit a bimodal distribution with two peaks. This indicates that these bowls were mainly produced in two small and large sizes. The first group with smaller and more restricted size range, 13-15 centimetres, were produced in greater numbers and the second larger bowls were produced in much smaller numbers and show a wider range of sizes (20-30 centimetres).

Sialk II pottery

Figures 7.22-7.26 demonstrate the distribution of rim diameters of vessel type B3a, B3b, B3c, B3d and B5 belonging to the Sialk II period.

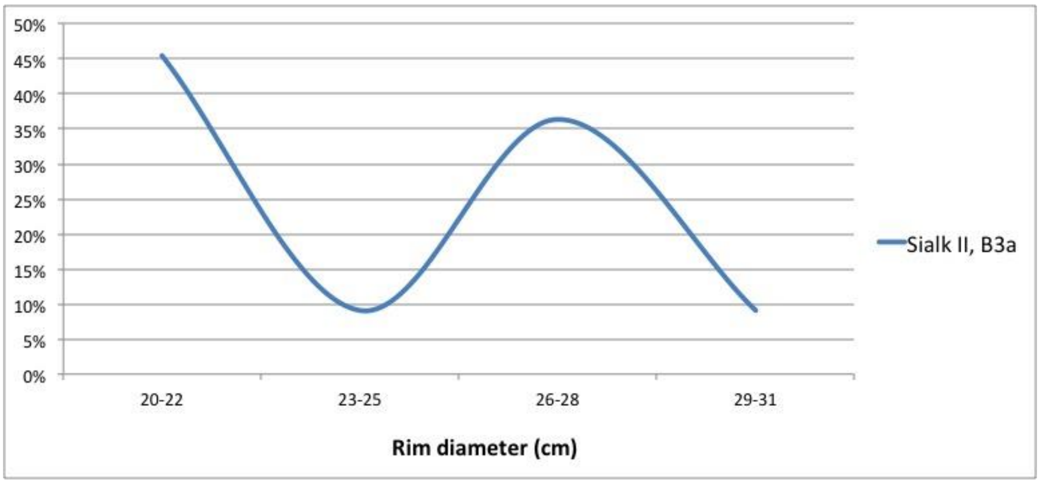


Figure 7.22 Distribution of rim diameters of vessel type B3a for Sialk II period.

Vessel B3a is an open bowl with a shallow inwardly sloped, 45-75° angle, straight-sided body. Figure 7.22 shows that the rim sizes of this Sialk II type pottery exhibits a unimodal distribution with only one broad peak, located in the range of 25-31 centimetres and peaking at 26-28 centimetres range. However, quite a large number of smaller bowls were also present in the 20-22 centimetres range.

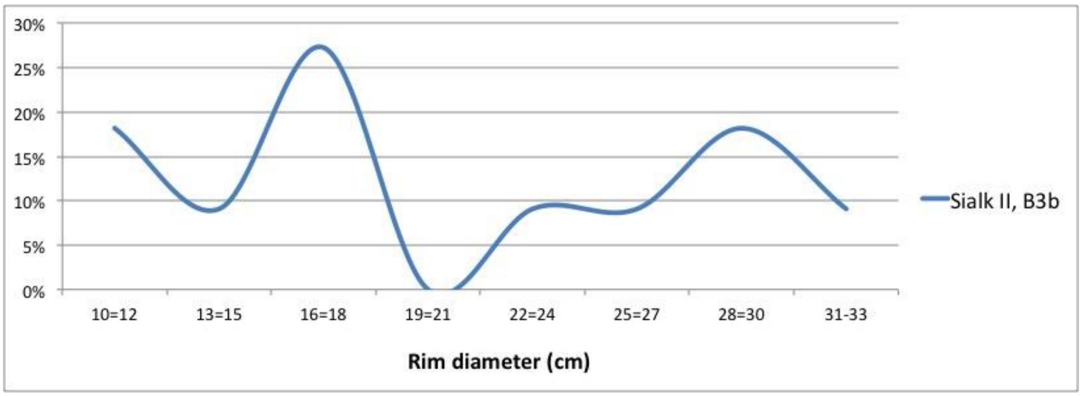


Figure 7.23 Distribution of rim diameters of vessel type B3b for Sialk II period.

Vessel B3b is an open bowl with a rounded and flared rim and a straight or slightly concave neck. The overall form and function of the vessels remains unclear, although it is likely that they were storage jars. Figure 7.23 shows that the rim sizes of these Sialk II vessels exhibit almost a trimodal distribution with three distinct peaks indicating the presence of three size ranges, small, intermediate and large. The first peak is relatively sharper and shows that the diameters of small bowls varies approximately in the range of 13-18 centimetres, peaking at 16-18 centimetres, although some smaller bowls (10-12 centimetres) were also produced. The second small peak reveals the existence of a limited number of intermediate size bowls, located mostly within the rim range of 22-24 centimetres. Finally, the relatively broad third peak indicates the presence of large bowls mostly in the size range of 25-33 centimetres, peaking at 28-30 centimetres, which were produced in smaller numbers in comparison with the smaller bowls.

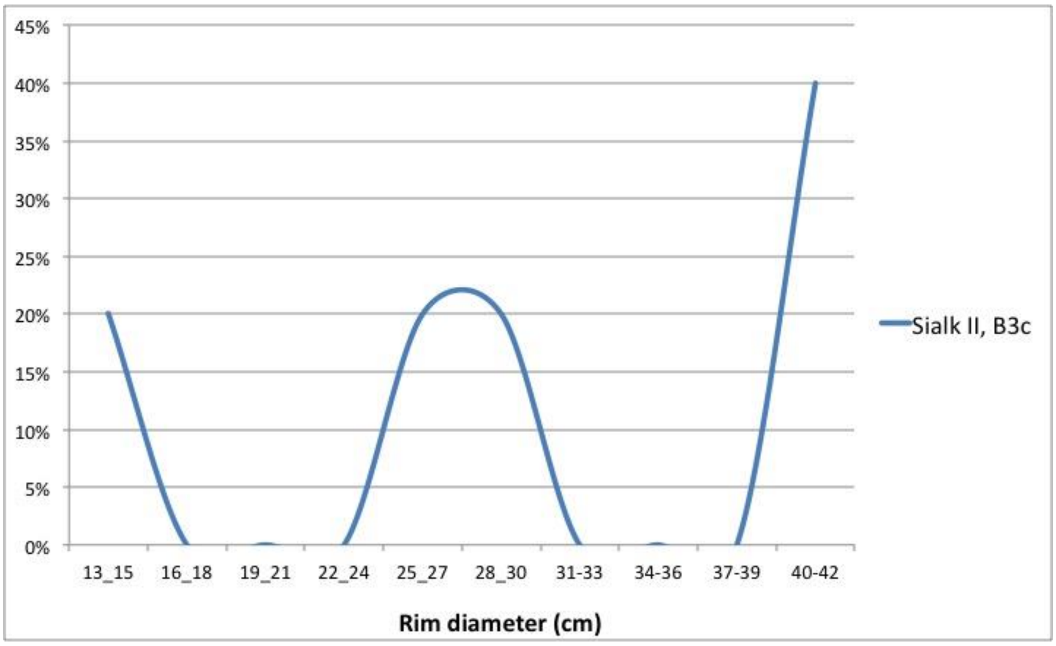


Figure 7.24 Distribution of rim diameters of vessel type B3c for Sialk II period.

Vessel B3c is an open bowl with a shallow inwardly sloped, 45-75° angle, gently curving body. Figure 7.24 shows that the rim sizes of these Sialk I vessels exhibit a unimodal distribution with just one distinct peak. This relatively broad peak shows that the diameter of bowls of this type varied in a range between 25-30 centimetres although a considerable number of very small bowls (range of 13-15 centimetres) as well as larger bowls, mainly in the range of 40-42 centimetres were also produced in great numbers.

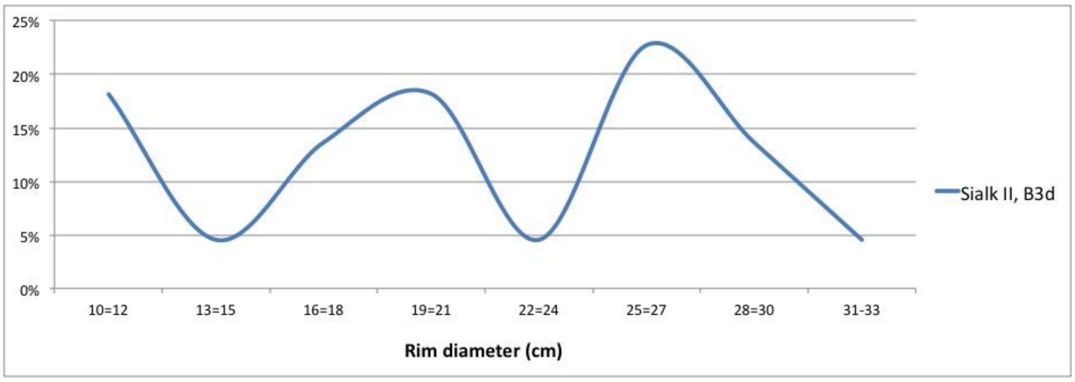


Figure 7.25 Distribution of rim diameters of vessel type B3d for Sialk II period.

B3d is an open bowl with a steep, straight shoulder, 75° to near 90 angle. Figure 7.25 demonstrates that the rim sizes of these Sialk II vessels exhibit a bimodal distribution with two distinct broad peaks. The first peak, which is slightly shorter and broader, shows that the smaller bowls were mostly 16-21 centimetres in diameter. The second peak reveals the existence of larger bowls located within the rim range of 25-33 centimetres. It also seems that bowls of both size ranges were produced in almost equal numbers. Meanwhile, a number of smaller bowls (range of 10-12 centimetres) were also produced.

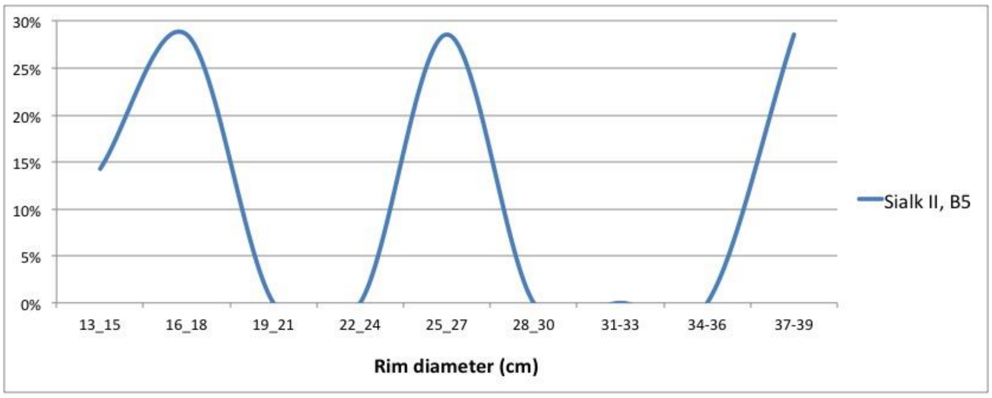


Figure 7.26 Distribution of rim diameters of vessel type B5 for Sialk II period.

B5 is an open bowl with a steep, inwardly sloped, 75° to near vertical angle, straight-sided body. Figure 7.26 shows that the rim sizes of these Sialk II vessels exhibit a bimodal distribution with two peaks, although a third half peak was also apparent. This indicates that these bowls were actually produced in three small, intermediate and large sizes. These three groups of bowls are all located in restricted size ranges of 16-18, 25-27 and 37-39 centimetres almost in equal numbers.

Pardis II pottery

Figures 7.27-7.31 illustrate the distribution of rim diameters of vessel type B3a, B3b, B3c, B3d and B5 belonging to the Pardis II period.

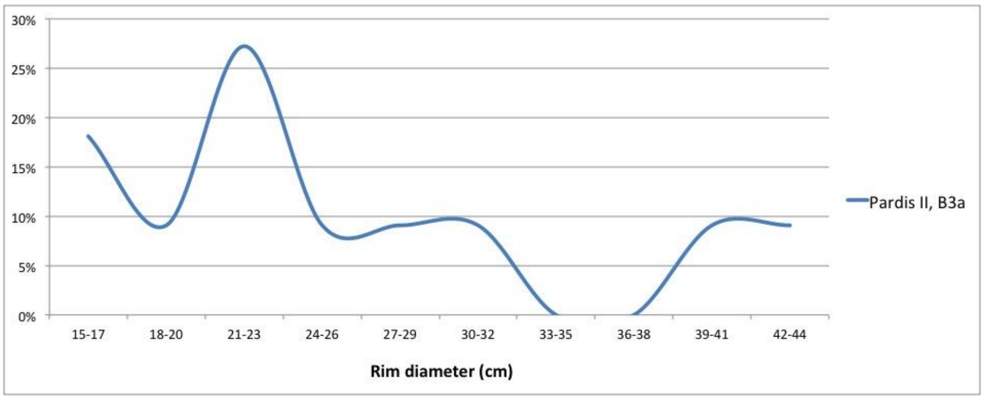


Figure 7.27 Distribution of rim diameters of vessel type B3a for Pardis II period

The vessel B3a is an open bowl with a shallow, inwardly sloped, 45-75° angle, straight-sided body. Figure 7.27 indicates that the rim sizes of this Pardis II type of pottery exhibit a distribution close to trimodal, with three distinct peaks indicating the presence of three size ranges, small, intermediate and large. The first peak is a much higher and relatively sharper peak and shows that the most abundant small bowls are approximately in the range of 21-23 centimetres, although there are some smaller bowls in the 15-17 centimetres range. A second small, broad peak reveals the existence of a limited number of intermediate size bowls, located mostly within the rim range of 27-32 centimetres. Finally, the relatively broad third peak indicates the presence of large bowls mostly in the size range of 39-44 centimetres, which were produced in smaller numbers in comparison with the small bowls.

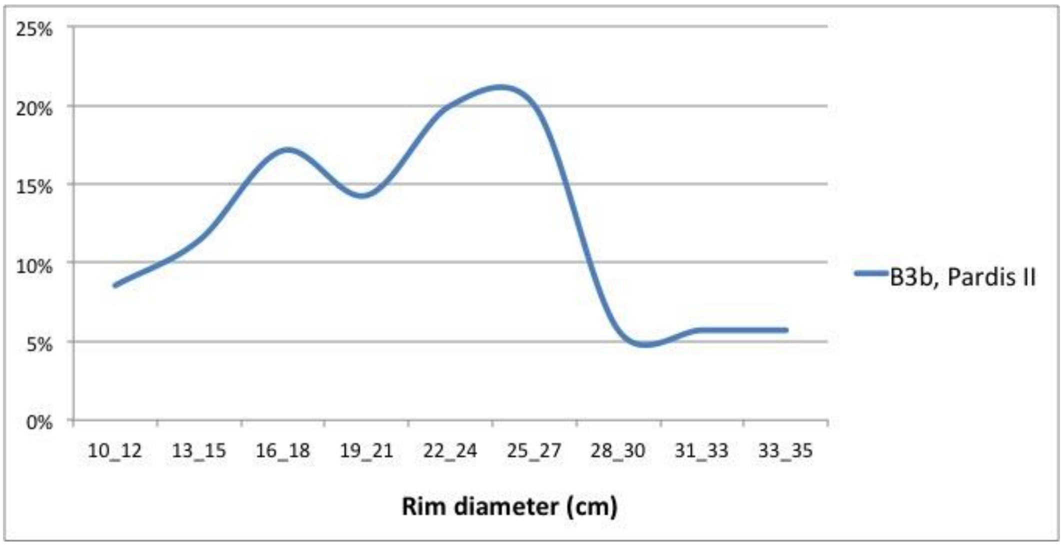


Figure 7.28 Distribution of rim diameters of vessel type B3b for pardis II period.

Vessel B3b is an open bowl with a rounded and flared rim and a straight or slightly concave neck. The overall form and function of the vessel remains unclear, although it is likely that they are storage jars. Figure 7.28 demonstrates that the rim sizes of these Pardis II vessels exhibit a bimodal distribution with two broad peaks. The first peak, which is shorter, shows that the diameters of smaller bowls vary in a range of 10-21 centimetres, peaking at 16-18 centimetres. The second, relatively broader and higher, peak reveals the existence of higher numbers of larger bowls within the range of 22-30 centimetres, with most of them in the 25-27 centimetres range (peak of the range). A much smaller hump also exists in the Figure, indicating the presence of some larger bowls in very limited numbers in the range of 30-35 centimetres.

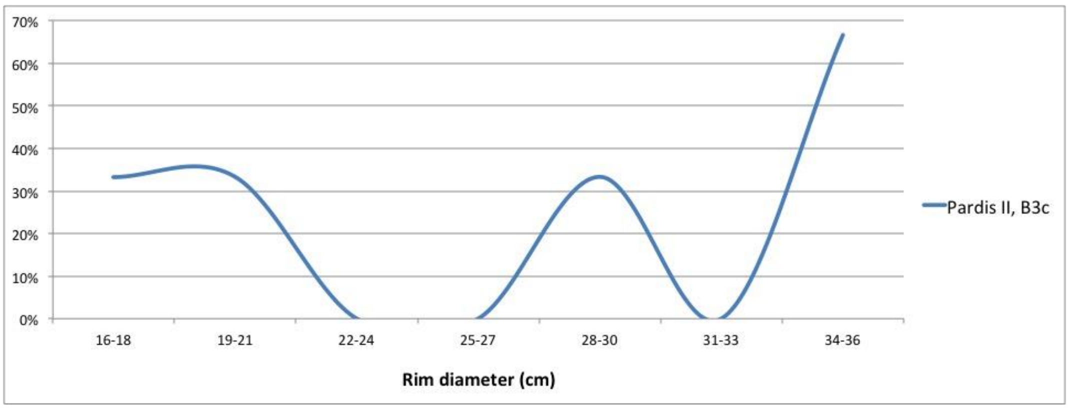


Figure 7.29 Distribution of rim diameters of vessel type B3c for Pardis II period.

Vessel B3c is an open bowl with a shallow inwardly sloped, 45-75° angle, gently curving body. Figure 7.29 shows that the rim sizes of these Pardis II vessels also exhibit a bimodal distribution with two peaks. The first peak, which is very broad, shows that the diameter of small bowls of this type varied in a wide range between 16-21 centimetres but peaking at 19-21 centimetres. The second, relatively sharper, peak reveals that the larger bowls within the restricted range of 28-30 centimetres were produced in larger quantities. A larger number of very large bowls mainly in the range of 34-36 centimetres were also produced.

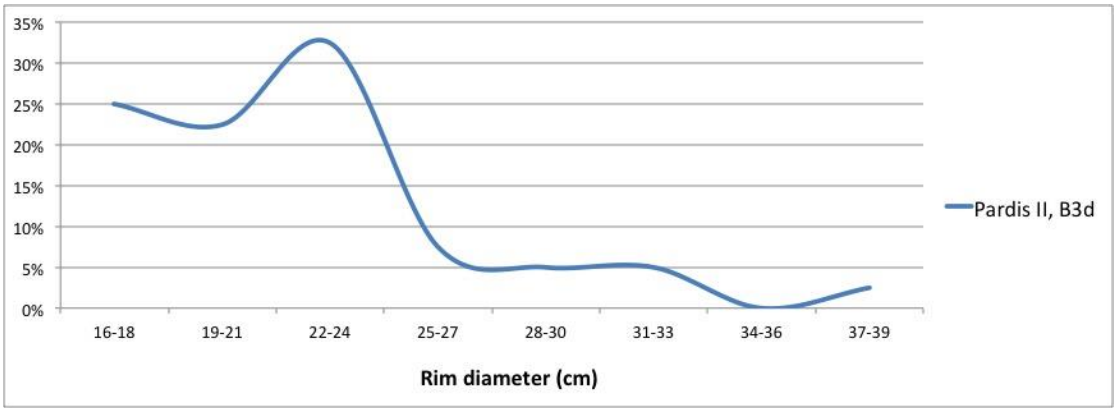


Figure 7.30 Distribution of rim diameters of vessel type B3d for Pardis II period.

B3d is an open bowl with a steep, straight shoulder, 75° to near 90 angle. Figure 7.30 shows that the rim sizes of these Pardis II vessels exhibit a unimodal distribution. The uniquet peak, which is relatively broad, shows that the bowls were mostly 19-27 centimetres in diameter. The figure also shows that larger bowls in the 28-33 centimetres diameter range were also produced in very small numbers.

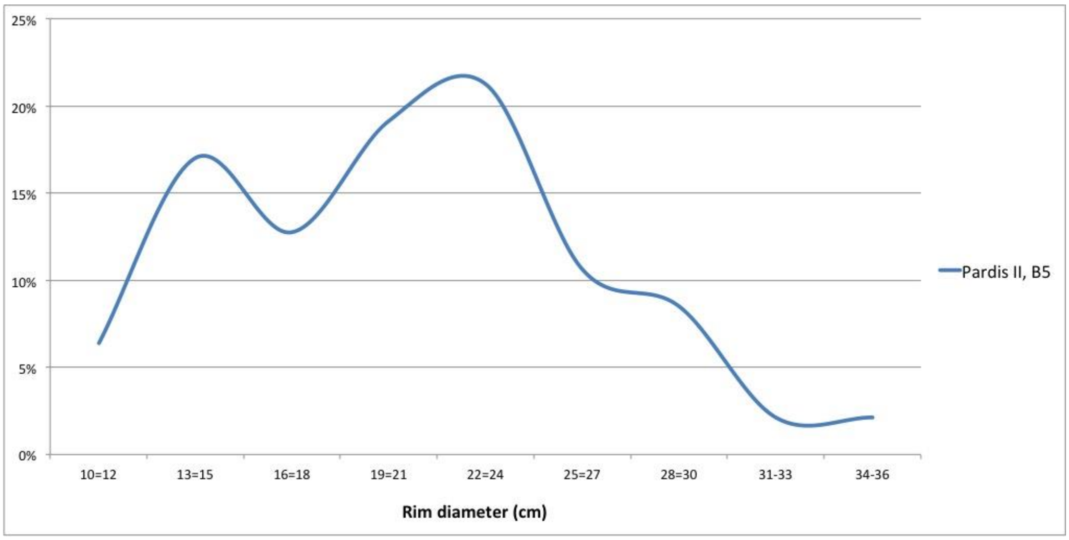


Figure 7.31 Distribution of rim diameters of vessel type B5 for pardis II period.

Vessel B5 is an open bowl with a steep, inwardly sloped, 75° to near vertical angle, straight-sided body. Figure 7.31 shows that the rim sizes of these Pardis II vessels exhibit a bimodal distribution with two major peaks. This indicates that these bowls were mainly produced in two small and large sizes. The first group, with a restricted size range between 13-15 centimetres, were produced in smaller numbers and the second, larger bowls, were produced in much greater numbers and show a wider range of sizes (19-27 centimetres), peaking in the 22-24 centimetres range. There is also a small shoulder present in the curve, indicating the presence of a small number of larger bowls in the range of 28-30 centimetres diameter.

7.2.2 Comparison of the rim diameters of various vessel types

Tables 7.23 and 7.24 illustrate a comparison of the distribution of rim diameters of vessel type B3b, B3c, B3d and B5 for Sialk I and Sialk II periods from Sialk as well as Sialk II vessel type B3c, B3d and B5 from Sialk and Pardis.

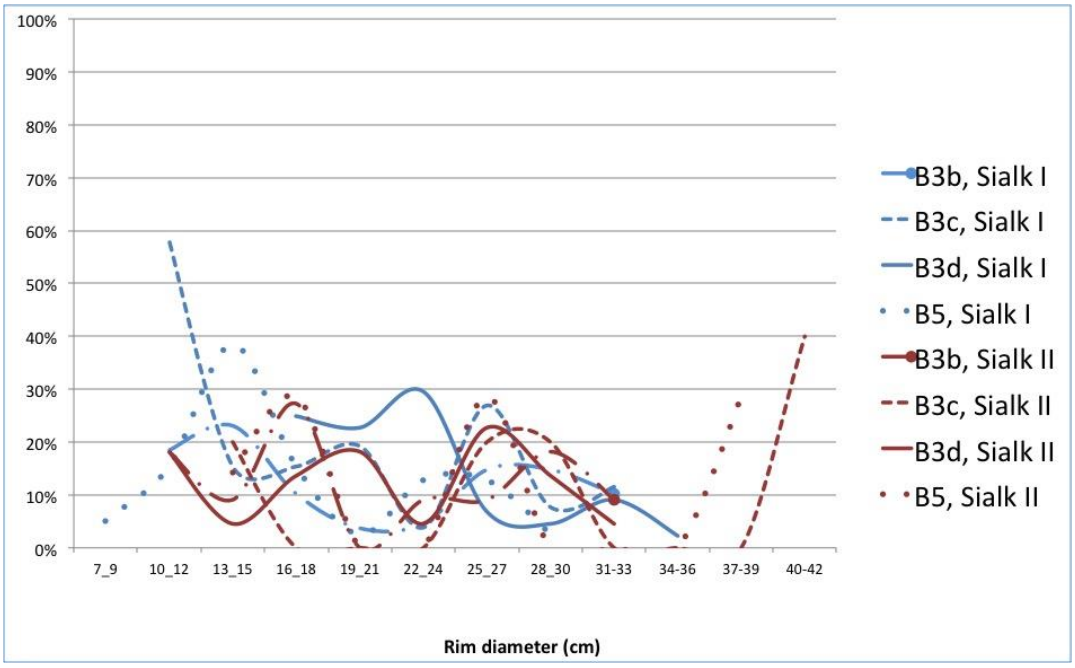


Figure 7.32 Comparison of the distribution of rim diameters of vessel type B3b, B3c, B3d and B5 for Sialk I and Sialk II periods from Sialk.

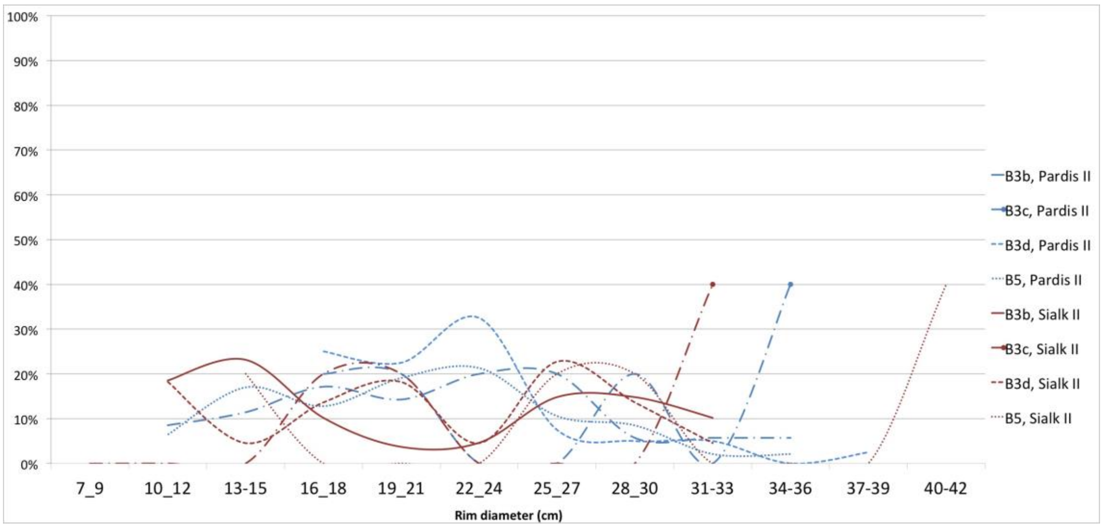


Figure 7.33 Comparison of the distribution of rim diameters of the Sialk II vessel type B3b, B3c, B3d and B5 from Sialk and Pardis.

One of the important characteristics of the Plateau’s ancient pottery was their form and size, which would have been associated with crucial performance and aesthetic implications. Ancient potters interacted with the communities in which they lived and practised their skills throughout the pottery-making process, commencing from the selection of suitable raw materials, employing the appropriate forming and firing processes and creating attractive decoration and design to produce useful pots; products that might properly fulfil the changing needs of their communities. The need for pottery in ancient communities was evidently diversified, encompassing the application to fields such as cooking, carrying, storage, communication, and ceremony.

The comparison of sizes of various types of vessels produced in different periods and sites may help us better understanding the evolution of the pottery-making process and underlying socio-economic changes of the prehistoric communities under study. For example, Figure 7.32 compares bowls of the B3b type between the Sialk I and II periods and shows that during the Sialk II period, the quantity and the size range of the smallest bowls of B3b type (10-18 centimetres range) of Sialk I were preserved with some little increase in their quantity and peak size (from 13-15 to 16-18 centimetres). It can also be seen that during the Sialk II period, a limited number of intermediate size bowls, located mostly within the rim range of 22-24 centimetres which were absent in Sialk I period, were added to these type of bowls. Finally, the size range of the largest bowls belonging to the Sialk I period were also preserved with some little increase in their peak size (from 25-27 to 28-30 centimetres).

By comparing bowls of B3c type from Sialk I and II periods, Figure 7.32 also shows that during Sialk II the quantity of the smallest bowls of B3c type (13-15 centimetres range) were drastically reduced in comparison with the Sialk I period (10-12 centimetres range). Moreover, the diameter range of the bowls of the small-intermediate type which varied in a wide range between 13-24 centimetres in Sialk I also moved to a narrower range of larger bowls between 25-30 centimetres. Meanwhile, a considerable number of very large bowls, mainly in the range of 40-42 centimetres, were also produced replacing the large bowls of Sialk I, which was located in range of 25-27 centimetres. Figure 7.32 also shows that during Sialk II period, B5 type bowls were actually produced in three small, intermediate and large sizes (16-18, 25-27 and 37-39 centimetres) and were produced in almost equal numbers, whereas these type of pottery in Sialk I period were mainly produced in two sizes. The first group was smaller and more restricted in size range (13-15) but were produced in greater numbers and the second group, of larger bowls, were produced in much smaller numbers and show a wider range of sizes (20-30 centimetres). This indicates the existence of more regular and standardised pottery-making practice in Sialk II period in comparison with Sialk I period.

On the basis of the aforementioned results, it may be speculated that a generally higher degree of specialisation and standardisation can be observed in Period II in comparison with Period I. Despite the similarity of most of the vessels produced during the Sialk I and II periods, it seems that the potters of Sialk in Period II limited or abandoned the production of certain sizes of vessels and producing new vessels differing in size with the existing ones or changing the quantity of certain products constantly - trying to fulfil the changing needs of their communities. These changes were probably made in response to the changing needs of the society in the fields of cooking carrying, and storage of food or other applications that related to the socio-economic change of the societies and their life style creating new needs and demand for pottery.

Figure 7.33 compares also bowls of the B3b type from the Sialk II and Pardis II periods and indicates that during the Pardis II period, the size range of the smallest bowls of B3b type of Sialk II (10-18 centimetres range) slightly increased to the 10-21 centimetres range. Meanwhile, the peak size was preserved (16-18 centimetres) and the intermediate size bowls, located mostly within the rim range of 22-24 centimetres, were merged into the range size of the larger bowls of Sialk II period to obtain a single broad peak in the range of 22-30 centimetres (peaking at 25-27 centimetres range). Furthermore, Figure 7.33's comparison of bowls of the B3c type from the Sialk II and Pardis II periods also showed that the quantity of the smallest bowls of B3c type was extended during the Pardis II period in comparison with the Sialk II period to encompass the range of 10-12 centimetres. The diameter ranges of bowls of the small-intermediate type, which varied in the range between 25 and 30 centimetres, were also restricted to the smaller and narrower range of 19-21 centimetres. The size of very large bowls, mainly in the range of 40-42 centimetres in Sialk II, was drastically reduced to the restricted range of 25-27 centimetres and their numbers were also considerably increased. Figure 7.33's comparison of bowls of B5 type from Sialk II and Pardis II periods also reveals that during the Pardis II period, the size range of the smallest bowls of B5 type were reduced in comparison with the Sialk II period (from 16-18 to 13-15 centimetres). In addition, the restricted size ranges of the intermediate size bowls (25-27) were enlarged to 19-27 centimetres to include the size range of 19-24 centimetres, never observed in the Sialk II period. In Pardis II, also the large bowls of Sialk II (37-39 centimetres) drastically reduced both in numbers and size restricting them to a small number of bowls in the range of 28-30 centimetres in diameter. On the basis of these results, we may speculate that during Pardis II period most of the fundamental features of the Sialk II pottery were preserved regarding the form and size of pottery. However, the potters of Pardis II made some modifications in the production of pottery by limiting, merging or expanding the size ranges of vessels and occasionally by producing new vessels differing in size with the Sialk II vessels, as well as by changing the quantity of certain products. These changes were made in response to the changing needs of their own communities which differed from the needs of Sialk's community at the same time.

7.3 Discussion of the results of Phylogenetic analyses of pottery

The purpose of this section is to discuss the results of the phylogenetic analysis of pottery from the sites of Pardis, Ebrahimabad and Sialk sites during the Late Neolithic and Transitional Chalcolithic periods.

7.3.1 Discussion of the Phylogenetic analyses of pottery decorations

The 66 characters (traits) of pottery decoration identified from the pottery of the six groups (taxa): Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II analysed in Chapter Five now will be discussed. The characters coded in Table 5.5 were classified on the basis of the Presence-absence in matrix of motifs as shown in Table 7.9.

Table 7.9 Presence–absence matrix of motifs at selected sites. Characters are listed consecutively from 1 to 66. 1= presence, 0= absence.

Site name	Characters-	1	2	3	4	5	6	7	8	9	10	11	12	13
		P.11	P.12	P.31	P.25	P.26	P.27	P.28	P.30	P.13	P.3	P.1	P.32	P.33
O.G.		1	0	1	0	0	0	0	1	0	1	1	1	1
Sialk I		1	1	1	1	1	1	1	1	1	1	1	1	1
Sialk II		1	1	0	1	0	0	0	1	0	1	1	1	1
Pardis I		0	1	0	0	1	1	1	0	1	1	0	0	0
Pardis II		1	1	0	1	1	1	0	0	0	1	1	1	0
Ebrahimabad I		1	0	1	1	1	1	1	1	1	1	1	1	1
Ebrahimabad II		0	0	0	1	0	0	0	0	0	1	1	0	0
Site name	Charac-ters	14	15	16	17	18	19	20	21	22	23	24	25	26
		P.46	P.40	P.16	P.53	P.54	P.55	P.56	P.6	P.17	P.10	P.37	P.42	P.34
O.G.		1	1	0	0	0	0	0	0	0	0	0	1	1
Sialk I		1	1	1	1	1	1	1	1	1	1	0	1	1
Sialk II		1	1	1	1	0	1	1	1	1	1	1	1	1
Pardis I		0	0	0	0	0	0	0	0	0	0	0	0	0
Pardis II		1	0	0	1	0	0	0	0	0	0	1	1	0
Ebrahimabad I		0	0	0	1	1	0	0	0	1	1	0	0	0
Ebrahimabad II		0	0	0	0	0	0	0	0	1	0	1	1	0
Site name	Charac-ters	27	28	29	30	31	32	33	34	35	36	37	38	39
		P.58	P.5	P.4	P.16	P.18	P.21	P.2	P.64	P.65	P.59	P.60	P.35	P.7
O.G.		0	1	0	0	0	0	0	0	0	0	0	0	0
Sialk 1		1	0	0	0	1	1	0	0	0	0	0	1	0
Sialk 2		1	1	1	1	1	1	1	1	1	1	1	1	1
Pardis 1		0	0	0	0	1	0	0	0	0	0	0	0	0
Pardis 2		1	1	1	0	1	0	1	1	1	1	1	1	1
Ebrahimabad I		0	0	0	1	1	0	0	0	0	0	0	0	0
Ebrahimabad II		0	1	1	0	0	0	1	0	0	0	0	0	1
Site name	Charac-ters	40	41	42	43	44	45	46	47	48	49	50	51	52
		P.45	P.44	P.43	P.41	P.24	P.48	P.49	P.51	P.52	P.38	P.36	P.14	P.23
O.G.		0	0	1	0	0	0	0	0	0	0	0	0	0

Sialk I	0	0	1	0	0	0	1	0	1	0	0	1	0
Sialk II	1	1	1	1	1	1	1	1	1	1	1	1	1
Pardis I	0	0	0	0	0	0	0	0	0	0	0	1	0
Pardis II	1	1	1	1	1	1	1	1	1	1	0	1	1
Ebrahimabad I	0	0	0	0	0	0	0	0	0	0	1	1	0
Ebrahimabad II	0	0	1	1	1	0	0	1	0	0	0	0	0

Site name	Charac-ters	53	54	55	56	57	58	59	60	61	62	63	64	65
		P.61	P.62	P.19	P.20	P.29	P.50	P.47	P.22	P.9	P.63	P.57	P.38	P.8
O.G.		0	0	0	0	1	1	1	0	0	0	0	0	0
Sialk I		1	0	0	0	0	0	0	0	1	1	0	1	1
Sialk II		1	1	0	0	0	1	1	0	1	0	1	1	0
Pardis I		1	0	0	0	0	0	0	0	1	1	0	0	1
Pardis II		1	1	1	1	1	1	1	1	1	0	1	1	0
Ebrahimabad I		1	0	0	0	0	0	0	0	0	1	0	0	1
Ebrahimabad II		1	0	1	1	0	0	0	1	0	0	0	0	0

Site name	Characters	66
		P.66
O.G.		0
Sialk I		0
Sialk II		1
Pardis I		0
Pardis II		1
Ebrahimabad I		0
Ebrahimabad II		1

The most parsimonious cladogram obtained from the data within Matrix 7.9, utilising phylogenetic software programme PAUP 4, is shown in Figure 7.34.

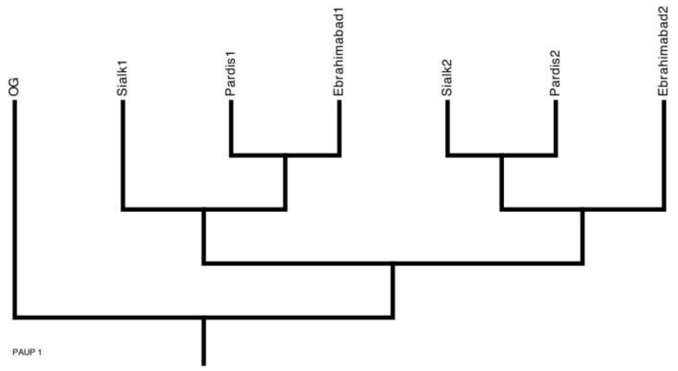


Figure 7.34 The most parsimonious cladogram obtained from the pottery decoration data.

The cladogram suggests that Sialk I, Ebrahimabad I and Pardis I all share a common ancestor and that Sialk II, Ebrahimabad II and Pardis II are descended from another common ancestor. The first three groups belong to Late Neolithic period and contained Sialk I pottery type and the second three groups belong to the Transitional Chalcolithic period and comprised Sialk II pottery type. The Consistency Index of the cladogram is 0.58 and the Retention Index is 0.52. It is low compared to other cultural datasets, but still suggests some phylogenetic signal is present (Collard et al. 2006).

7.3.2 Discussion of the Phylogenetic analyses of pottery forms

The 23 pottery form characters identified in the six groups (taxa): Sialk I, Ebrahimabad I, Pardis I, Sialk II, Ebrahimabad II and Pardis II analysed in Chapter Five will now also be discussed. The characters coded in Table 5.5 were classified on the basis of the Presence–absence in matrix of motifs as shown in Table 7.10.

Table 7.10 Presence–absence matrix of pottery form at selected sites. Characters are listed consecutively from 1 to 23. 1= presence, 0= absence.

Site name	Chara-cters	1	2	3	4	5	6	7	8	9	10	11	12	13
		J1a	J1b	J1c	J2	B1a	B1b	B1c	B1d	B1e	B2a	B2b	B2c	B3a
O.G.		0	1	0	1	0	0	0	1	**0**	1	1	1	0
Sialk I		1	1	0	1	1	1	1	1	1	1	1	0	1
Sialk II		1	0	0	0	0	1	1	0	1	0	0	0	1
Pardis I		0	0	1	0	0	0	0	0	0	0	1	0	0
Pardis II		1	1	1	1	1	1	0	1	1	1	1	1	0
Ebrahimabad I		0	0	0	1	0	0	0	0	0	0	1	1	1
Ebrahimabad II		0	1	0	0	1	0	1	0	1	1	1	1	1

Site name	Chara-cters	14	15	16	17	18	19	20	21	22	23
		B3b	B3c	B3d	**B4a**	B4b	B5	T1	T3	D1	BE1

O.G.	1	1	0	0	0	0	0	0	1	1
Sialk I	1	1	1	1	1	1	1	1	0	0
Sialk II	1	1	1	1	1	1	1	1	1	1
Pardis I	1	1	0	0	0	0	0	0	1	0
Pardis II	1	1	1	1	1	1	1	1	1	1
Ebrahimabad I	1	1	1	0	0	0	0	0	0	0
Ebrahimabad II	1	1	1	0	0	1	1	0	1	0

The most parsimonious cladogram obtained from the data of Matrix 7.10, utilising phylogenetic software programme PAUP 4, is shown in Figure 7.35. The Consistency Index of this cladogram is 0.58, and its Retention Index is 0.56.

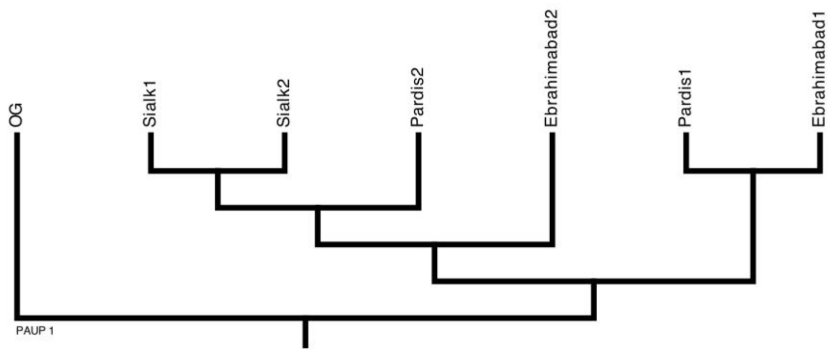


Figure 7.35 The most parsimonious cladogram obtained from the pottery forms data.

The cladogram suggests that Sialk II is directly descended from Sialk I but that Pardis II and Ebrahimabad II cluster with Sialk assemblages instead of with earlier assemblages from those sites. This suggests that Pardis II and Ebrahimabad II are more influenced by Sialk rather than by their own earlier periods. The detailed study of the quantity and type of all the pottery forms (traits) within the six taxa as well as the archaeological findings and scientific analyses reveal that the site of Sialk has had an older and far more developed and extended tradition of pottery-making in the period of Late Neolithic in comparison with the other two sites, exhibiting greater numbers of highly diversified type of well-made pottery. Therefore, it may be speculated that during the Late Neolithic period, the Sialk I tradition could have spread to Pardis and Ebrahimabad and replaced local traditions, although the remnants of the older traditions still can be observed in a very limited extent. The great majority of the pottery forms in Pardis I and Ebrahimabad I have similar counterparts in Sialk I. Pardis and Ebrahimaba, in subsequent stages of their development in the Transitional Chalcolithic period, were under a strong influence from Sialk II and, in a more limited scale even Sialk I, in the absence of strong local traditions. The Sialk I tradition had possibly been an established tradition within these sites at the time of entering the Transitional Chalcolithic period. It is interesting to note that the site of Ebrahimabad, which is currently a small mound was under stronger influence from Pardis II in comparison with Sialk II. It seems that in the later stages of its development, Pardis had grown to have a more advanced and large community with the ability of exerting its influence on other areas located within the Central Plateau of Iran.

7.3.3 Comparison of the results of Phylogenetic analyses of pottery forms and decorations.

According to the Retention Index (RI) values, as reported and discussed above, the typological characters of pottery exhibiting higher RI value (0.56) better fits the most parsimonious tree as compared to the pottery decoration characters (RI=0.52). Hence, the majority of similarities in typological characters among the pottery assemblages can be explained by a tree-like model of descent, i.e. like genes, these traits have been transmitted vertically between parents and offspring. However, considering the relatively low value of RI in the case of pottery decoration, a relatively impaired fit, and hence weaker phylogenetic signal can be assigned to these characters. This can probably be attributed to the horizontal transfer of these traits among potters of the region, a practice which had been more common and achievable. This is also consistent with the fundamental finding of this thesis that based on existing similarities in the overall evolution pattern of pottery production technology as well as some of the characteristics of pottery such as form and decoration concluded that the cultural/technical interactions and exchanges between the prehistoric communities living in this region in the specified time period seems to be extremely likely.

7.4 Discussion of the results of scientific analyses of pottery

7.4.1 Production technology of pottery and its evolution

In this thesis, pottery collected during excavations in Sialk. Ebrahimabad and Pardis sites located in the Central Plateau investigated in order to determine their chemical and mineralogical compositions and the sample microstructures to gain more precise and reliable information regarding the technical aspects of the pottery-making and its development. The evidence presented in Chapter Six will now be used to assess pottery production techniques and its evolution as well as the nature of change in the ceramic production techniques in the Late Neolithic and Transitional Chalcolithic periods, revealing the degree of specialisation and standardisation of pottery production, as well as mode of production during these periods at the three sites.

7.4.2 The effect of heat on pottery and estimation of the firing temperature at the three sites

Background

According to Rice (2015) and El-Didamony et al. (1998), $CaCO_3$ decomposes at 800–850 °C and the lattice structure of Illite clays collapse in the 850-1000 °C temperature range (Rice 2015). In calcareous clays fired to 850 °C or above, the presence of CaO may cause some problems as calcium oxide particles are highly hygroscopic. Over time, they may pick up moisture, forming quicklime, which is accompanied by volume expansion and stresses, causing cracking and spalling of the surrounding clay body (Rye 1976). If the CaO content is high and the particles are relatively large, this may give the fired ware a low strength. If the body is fired at temperatures 850-900 °C or beyond, the rehydration does not occur as at these temperatures calcium in clays becomes part of a liquid phase with sintering and vitrification. Tite and Maniatis (1975a) suggested that in calcium and Mg rich clays, melting begins at lower temperatures (approximately at 800 °C) because Ca and Mg may act as fluxes (Segnit & Anderson 1972). That is why ancient potters might have explored these kinds of clays to make their pots using less energy.

Didamony et al. (1998) studied the firing behaviour of calcareous clays and also observed distinct firing shrinkages in the 1050-1150 °C temperature range, which were attributed to the formation of a liquid phase in compositions located in the vicinity of the major eutectic of the SiO2–CaO–Al2O3 system. This eutectic has CaO/SiO2 and Al2O3/SiO2 molar ratios of 0.402 and 0.140 respectively and a fusion point of 1165 °C. Obviously, the most efficient densification and vitrification process should occur in the above temperature range.

The firing process of Sialk I pottery

On the basis of PXRD analysis, apart from very few old specimens of Sialk I pottery revealing the presence of the faint trace of $CaCO_3$ (Calcite), there is no evidence for the presence of $CaCO_3$ or CaO phases in the samples of Sialk sherds. On the other hand, calcium iron aluminium silicate minerals, namely Esseneite, was clearly detected in Sialk I pottery. Therefore, it can be deduced that the iron oxide liberated from the decomposition of the clay minerals, possibly Illite, has mainly been incorporated into the Esseneite crystal structure, which could accommodate high amounts of iron (43.3 wt%), and no Hematite crystals were detected in the sherd specimens. On the other hand the Hematite crystals is responsible for the generation of the red colur of pottery, but calcareous lumps present in calcium-rich clay may prevent the formation of Hematite crystals by fixation of iron in the network of new-formed calcareous silicate and aluminosilicate minerals and consequently, inhibit the generation of red colour in the fired pottery.

Esseneite, owing to its very low content of SiO_2 (23.2 wt %) and high content of Fe_2O_3 (43.3 wt%) and CaO (21.65 wt %), is a low melting point mineral which gives it the capability of formation at relatively lower temperatures in comparison to the temperatures mentioned in the above reports.

On the other hand, Sialk I and II specimens from the site of Sialk had a ratio of CaO/SiO_2 = 0.50 and 0.107 respectively, calculated using the mean values of the sherd compositions, and a ratio of Al_2O_3/SiO_2 = 0.124 and 0.082. Hence, it can be deduced that the compositions of Sialk I and II sherds, especially the latter sherds, are located relatively far from the aforementioned eutectic as reported by El-Didamony et al. (1998). Therefore, it can be anticipated that the sintering and vitrification processes within this pottery possibly occur at relatively higher temperatures than 1050-1150 °C range reported by the above researchers. However, the presence of higher content of alkali oxides and iron oxide in the clays, which reduce the melting point and the viscosity of the liquid phase in the course of firing of the pottery, resulted in the occurrence of sintering and vitrification processes at relatively lower temperatures than the above temperature range. Hence, considering the decomposition and distraction temperatures of calcium carbonate and illitic clay minerals, the sintering and vitrification processes of this type of pottery, and the formation temperatures of calcium ferrosilicates minerals such as Esseneite, as discussed above, it can be suggested that Sialk I pottery was fired at the 850-900 °C temperature range.

The firing process of Sialk II pottery

El-Didamony et al. (1998) has shown that during the firing of a calcareous clay, the content of the mineral Diopside which first appeared at 850 °C, gradually increased up to 1150 °C, whereas Eftekhari Yekta and Alizadeh (2001) detected the formation of Diopside in the 930-1080 °C temperature range during the firing of a calcareous clay having a similar composition to the latter clay. The calcium-poor samples of Sialk II sherds studied in this work exhibited quite dense and vitrified microstructures (Figures 6.9 and 6.12).

This could only have been achieved by the presence of a liquid phase in a sufficient quantity and with a relatively low viscosity at the maximum firing temperature. Considering the higher refractoriness of the raw materials used in the production of the low calcium Sialk II pottery, owing to their higher content of SiO_2 and Al_2O_3 and much lower content of CaO as discussed above, a much higher firing temperature should be anticipated for these pottery in comparison to the Sialk I pottery. Meanwhile, considering the impeding effect of CaO in generation of red colour in pottery Ca-poor samples were of red colour both on surface and core (see the discussion regarding the firing process of Sialk I pottery above).

On the other hand, considering the technical difficulties involved in construction and handling of high-temperature kilns in prehistoric times and the absence of high-temperature phases such as Mullite, Anorthite and Hedenbergite in the sherds studied in this thesis, the use of temperatures in excess of 1100 °C in the firing of this pottery seems unlikely. Therefore, on the basis of the above facts and observations, the temperatures range of 1050-1100 °C can be assigned to the firing of the low calcium Sialk II pottery investigated. It should be noted that the other type of Sialk II type pottery with a red coating, owing to their similarity in chemical and mineralogical compositions to the Sialk I (buff) pottery of the same site, were probably fired at lower temperature ranges, perhaps at the midway between the Sialk I and II pottery. It should be noted that in non-industrial firing, there might be considerable fluctuations in firing temperatures. Even in kiln firing, temperature differences of as much as 100 °C may exist between different sections of the kiln (Mayes 1961, 1962). Under these conditions, the determination of the exact firing temperatures is impossible but the relatively high range of firing temperatures as stated above, and the good quality of the fired ware (very dense products with no deformation), indicate that the early potters of the region had remarkable skill and experience in the selection of raw materials and firing techniques of pottery.

The firing processes of Sialk I and II type of Ebrahimabad pottery

As mentioned above, and summarised in Table 6.9, minerals such as Quartz and Augite (Calcium Aluminium Iron Magnesium Silicate, $Al_{0.42}Ca_{0.818}Fe_{0,269}Mg_{0.792}O_6Si_{1.751}$) are the major phases present in almost all the Sialk I type pottery sherds of Ebrahimabad. The Sialk II type specimens are also composed of the same Quartz and Augite minerals, as the Sialk I type sherds, plus Hematite minerals. It should be stated that the Augite mineral present in both Sialk I and II type samples of Ebrahimabad are different from the Augite detected in the Sialk II samples of the Sialk site, i.e. it contains more SiO_2 (47.44 against 45.95 wt%) and less CaO (20.69 against 23.79 wt%). This may be attributed to the difference in chemical composition of the samples of Sialk II and Ebrahimabad I or II as well as the firing temperature of Ebrahimabad's pottery. The Sialk I type pottery of Ebrahimabad, because of its higher content of SiO_2, Al_2O_3 and lower content of CaO, is more refractory in comparison with Sialk I pottery from the site of Sialk itself and thus required higher temperatures for sintering and vitrification. On the other hand, the major silicate mineral appearing on the firing of Ebrahimabad's pottery is Augite with higher content of SiO_2 and lower content of CaO (see above) and much lower content of Fe_2O_3 (10.62 wt%), which could be formed at relatively higher temperatures in comparison with the Esseneite mineral (the major silicate mineral of the Sialk I pottery of the Site of Sialk) which because of its very low content of SiO_2 (23.2 wt %) and high content of Fe_2O_3 (43.3 wt%) and CaO (21.65 wt %) is a low melting point mineral which gives it the capability of formation at relatively lower temperatures. Moreover, considering that Sialk I type pottery from Ebrahimabad exhibits denser and more vitrified microstructures (Figures 6.20-6.24) in comparison with Sialk I pottery from site of Sialk, they should have been fired at higher temperature range such as 950-1000 °C.

On the other hand, Sialk II type pottery from Ebrahimabad possesses similar major mineral phases as Sialk I types (Quartz and Augite minerals), plus a Hematite phase.

As Hematite crystals responsible for the red colour of pottery can only be formed within an oxidising atmosphere, the mastering of firing techniques such as the accurate control of firing temperature and atmosphere the production of the red pottery was necessary at Ebrahimabad. Although most of the Sialk II type red pottery samples from Ebrahimabad are distinguished by the strong red colour of their surface and buff colour of core, relatively few sherds, e.g. the last two samples shown in Table 6.8 were of red colour both on core and surface (Table 6.10). It should be noted that the aforementioned sherds which possessed relatively lower content of CaO were the fragments of the fine and dense thin section pottery excavated at Ebrahimabad. In addition to the low content of CaO, which is the principal factor in producing the pottery which are of red colour both on core and surface (see Section 7.4.2, firing process of Sialk I and II pottery), the thin section which allows the penetration of atmospheric oxygen deep into the inner layers of the ware also facilitated the process of producing the aforementioned red pottery from Ebrahimabad. The sample E2e with a relatively high content of CaO (16.6 wt%), seems to be an exception, since according to the examination of the sample it also has red core and surface.

Therefore, on the basis of the above facts and observations, generally the temperature range of 1000-1050 °C can be assigned to the firing of Sialk II type pottery from Ebrahimabad with the exception of a few low calcium pottery which perhaps were fired at higher temperatures. It is also interesting to note that the elevation of temperature (~50 °C) due to the use of more oxidising atmosphere in the process of firing of red Sialk II pottery, as discussed above, had no observable effect on the main mineral composition of this pottery, except the appearance of Hematite (Fe_2O_3) crystals.

The firing process of Sialk I and II type of Pardis pottery

Table 6.13 demonstrates that Quartz and Augite (Aluminium Iron Magnesium Silicate), similar to the Augite mineral found at the site of Ebrahimabad, are the major phases present in almost all the Sialk I type pottery sherds from Pardis. These pottery sherds, because of their higher content of SiO_2 and Al_2O_3 and lower CaO content, are more refractory in comparison with Sialk I pottery from the Site of Sialk and possibly have been fired at higher temperatures. The major silicate mineral to appear on the firing of this pottery is Augite, which due to its higher content of SiO_2 and much lower content of Fe_2O_3, could be formed at relatively higher temperatures than the Esseneite phase of the Sialk I pottery from the site of Sialk.

On the basis of the above discussion, temperatures range of 950-1000 °C can be estimated for the firing of Sialk I type pottery from Pardis, which is the same temperature range as suggested for the firing of Sialk I type pottery from Ebrahimabad. Considering the similarity of the chemical compositions of the Sialk I type pottery from both Ebrahimabad and Pardis, as well as the presence of almost the same major silicate phase (Augite) in both corpuses, this estimation seems reasonable. Sialk II type specimens which were rich in calcium were mainly composed of the same phases as the Sialk I type specimens, whereas specimens poor in calcium possessed Quartz, Hematite and another major phase, structurally similar to a Orthopyroxene mineral (Iron Magnesium Calcium Silicate) with the following formula: ($Ca_{0.043}Fe_{0.802}Mg_{1.155}O_6Si_2$ CPDS card No. 01-086-0163). The latter pyroxene phase is structurally similar to Diopside which usually becomes a major phase of pottery above 1000- 1050 °C temperature range (El-Didamony et al. 1998, Eftekhari Yekta & Alizadeh, 2001).

It should also be noted that the aforementioned specimens containing less calcium, because of their higher content of SiO_2 and lower CaO, are more refractory in comparison with Sialk I type pottery from the same location and the Sialk II type pottery from Ebrahimabad. The above Sialk II type sherds studied in this work also exhibited quite dense and vitrified microstructures (Figures 6.38-6.40) that could only have been achieved by the presence of a liquid phase, in a sufficient quantity and with a relatively low viscosity, at the maximum firing temperature. Considering the above points, the range of 1050-1100 °C, which is similar to the firing temperature range of Sialk II pottery from the site of Sialk site, can be suggested for the firing of these vessels from Pardis.

The origin of red colour in Sialk II type pottery at the three sites

Sialk site

The two different types of Sialk II pottery from the site of Sialk, calcium rich and poor in calcium, showed different microstructures and phase compositions. The group one specimens, calcium rich, are distinguished by the strong red colour of their surface and buff colour of core. In contrast, the specimens of the second group were of red colour, both on core and surface. SEM elemental maps (Figures 6.14 and 6.15) showed that the fine red slip present on the exterior and interior surfaces of the latter Sialk II sherds contained pigments rich in iron oxide. The aforementioned sherds, with the exception of the red coating, possessed similar phases as the sherds of Sialk I pottery - namely Quartz and Esseneite. It is interesting to note that there are also a few Sialk I sherds that were covered with a red coating, for example sample S1ab (Figure 6.8). Hence, it can be concluded that the technique of applying red coatings on the Sialk pottery had been an old technique that continued from Sialk I to Sialk II periods. Figures 6.16 and 6.17 (Chapter Six, Section 6.2.4) depict the typical elemental spectra of some Sialk II samples. It can be seen that the sample S2c, having a red coating on its exterior and interior surfaces, exhibits a relatively large difference in iron content between its surface and core (Figures 6.16 a and b). However, the other sample (sample S2p) is red both on the surface and core represents a much smaller difference in iron content (Figures 6.17 a and b).

It is interesting to note that the difference observed between the content of iron on the exterior surface and the core of the specimens, as determined by SEM elemental map of different sections as discussed above, was proved to extend to other pottery sherds as well. Therefore, it can be introduced as a good criterion to demonstrate the existence or absence of a red coating on the surface of the pottery (Table 6.6, Section 6.2.4). On the other hand, although the faint trace of Hematite was observed in some red coated pottery, the relatively strong trace of the latter oxide was identified in all the samples of the second group of Sialk II specimens which were red both on surface and core. Although the iron oxide minerals may be present in the clays used as raw material in production of pottery, this oxide can also be generated during firing of pottery in an oxidising atmosphere, as the product of destruction of iron containing minerals present in raw materials and recrystallisation of secondary Hematite crystals. However, as discussed above (Section 7.4.2, firing process of Sialk I and II pottery) it must be taken into account that calcareous lumps in calcium-rich clay may prevent the formation of Hematite crystals by fixation of iron in the network of new-formed calcareous silicate and aluminosilicate minerals and consequently, inhibit the generation of red colour in the fired pottery (Rice 2015).

The aforementioned process has apparently occurred in the case of Sialk I pottery as well as calcium rich Sialk II pottery, as discussed above. In calcium poor Sialk II pottery, which are red both on the surface and core, however, the major calcium aluminium iron magnesium silicate mineral (Augite) accommodates much lower amounts of iron oxide (7.54 wt %). Moreover, owing to the low content of calcium in the clay raw materials, the volume of the Augite mineral would be lower in comparison to the Esseneite mineral in Sialk I and calcium rich Sialk II pottery. Hence, a greater proportion of iron oxide present in the raw materials of this group appeared as the iron oxide mineral (Hematite) in the fired bodies.

Ebrahimabad site

SEM elemental map showed no difference between content of iron on the interior and exterior of the red specimens (Figure 6.30 and Table 6.10 Chapter Six, Section 6.3.4). Therefore, contrary to some Sialk II specimens belonging to the site of Sialk, the presence of a red iron rich coating on the outer surface of Sialk II type red pottery from Ebrahimabad should be ruled out.

Since the formation of Hematite crystals that is necessary for the initiation of red colour in pottery could only be possible in an oxidising atmosphere, it may be suggested that the main factor responsible for the change from the apparently, buff-coloured vessels to the distinctively red wares was a more efficient and ingenious control of the firing process (also see Section 7.4.2. the firing processes of Sialk I and II type of Ebrahimabad pottery).

Pardis site

SEM elemental mapping showed no difference between the content of iron on the interior and outer surface of the red specimens (Figure 6.42 and Table 6.14) thus ruling out the presence of a red iron rich coating on the surface of the Sialk II type pottery from Pardis, like Ebrahimabad's pottery. It was also observed that in 50 % of the Sialk II type, red pottery specimens are distinguished by the red colour of their surface and buff colour of the core whilst the remaining 50 % of the samples were of a red colour, both on the core and surface. It should be noted that the latter sherds all possessed relatively lower content of CaO (Tables 6.12 and 6.14).

7.4.3 The course of evolution in the pottery-making at the three sites

Sialk site

Ghirshman (1938) claimed that there was a gradual development at the site of Sialk from the Late Neolithic with cultural continuity demonstrated through ceramics and architecture. He divided the site into two main phases, Sialk I (Late Neolithic) and Sialk II (Transitional Chalcolithic). These periods were primarily defined according to architectural remains, predominantly the presence of pisé *walls* and burials (Ghirshman 1938). At Tepe Sialk in the lowest level of the North mound, called Sialk I, Ghirshman proposed five sub-phases (1-5) for Sialk I and divided the ceramics into four main groups on basis of the colour and decoration of the pottery.

Later on Malek *Shahmirzadi* (1995) suggested that Period I and II in fact could be considered one period as many of the features of Period I continue into Period II. He also pointed out various similarities in forms of pottery wares between the two main phases of Sialk. In confirmation of Malek Shahmirzadi's idea, Wong (2008) also proposed that the ceramic industry of Period II was essentially a continuation of Period I and is characterised by an improvement in firing condition.

In pursuing the aim of the present project by introducing new insights into our understanding of pottery evolution from the Late Neolithic through the Transitional Chalcolithic (ca. 5700-4800 BC) period within the Central Plateau in Iran, we utilised more advanced scientific analysis methods in the study of ancient pottery. This was in order to gain more precise and reliable information that could help better understanding the chronology and cultural-technological development of this region. In this light, it is interesting to review the notable but gradual evolution of pottery-making at Sialk, commencing from the more fragile Sialk I buff pottery of Sialk I to the same bodies covered with a red slip and eventually leading to the high quality, fine and quite strong, bulk red pottery. This transition has been underpinned by the absolute sequence from the site of Sialk, as shown in Tables 6.1 and 6.2.

The pottery of the main groups of Sialk I and II shown in this table can be divided into four sub-groups of a, b, c and d according to date. Sub-group (a) contains the earliest pottery sherds collected from the contexts 6032, 6033, 6035 (dated as 5894-5725 BC), as well as 6036 and 6036 (dated as 5775-5642 BC). Intermediate sub-group (b) collected from contexts 6013, 6009 (dated as 5465-5442 BC and the subgroup (c) was collected from contexts 6018, 6016 as well as 5117 and 5095 (dated as approximately 5300-5200 BC range). The latest subgroup (d) was collected from contexts 5026, 5023, 5021 and 5017 (dated as 4982-4973). According to the SEM micrographs, marked differences in density, degree of vitrification and porosity were observed between the two type of pottery, the earlier Sialk I and the latest Sialk II pottery; for example, the samples S1h and S2p (Figures 6.3 and 6.12). While, no difference were observed between the microstructure of various specimens of the older phase of Late Neolithic pottery, for example samples S1h and S1ae (figures 6.3 and 6.4) a considerable difference were existed between the earlier and later phases of the Late Neolithic pottery specimens, e.g. samples S1h and S1c (Figures 6.3 and 6.6). Also, various pottery specimens belonging to the range of the later phase of Sialk I pottery, e.g. samples S1m and S1c with different dating exhibited little difference in microstructure (Figures 6.5 and 6.6, also see Table 6.1). It is interesting to note that some of the pottery of the Sialk I group, belonging to the latest sub-group of (c) such as the samples S1ab, and S1r (Appendix A), contained a red coating on their interior and exterior surfaces. This indicates that in the later stages of Sialk I period, as specified by their decoration, the application of red slip on the pottery had been practised by the potters of Sialk. This finding implies that the red colour and the specific decoration of the Sialk II pottery are not necessarily coincidental with each other.

On the other hand, the latest subgroup (d), contained the two different type of red Sialk II pottery, calcium rich and poor in calcium. The calcium rich specimens had been covered with a red coating, whereas the specimens of the other group (poor in calcium) were of red colour both on core and surface. The SEM elemental maps (Figures 6.14 and 6.15) showed that the fine red slip applied on the exterior and interior surfaces of the calcium rich pottery contained pigments rich in iron oxide. As discussed above, the aforementioned group of Sialk II specimens showed substantially different phase compositions and microstructures, they possessed similar phases as the sherds of Sialk I pottery, namely Quartz and Esseneite. However, the other group of pottery sherds, which were red both on surface and core, mainly contained Quartz, Hematite and Augite (Calcium Aluminium Iron Magnesium Silicate) phases.

Ebrahimabad site

As mentioned above, all the Sialk I type pottery sherds of Ebrahimabad have similar chemical compositions and almost all of them are composed of minerals such as Quartz and Augite (Calcium Aluminium Iron Magnesium Silicate). These pottery sherds also exhibit very similar microstructures (for example, Samples E1c, Figure 6.20 and E1t, Figure 23, Section 6.3.4) with a difference of ~ 300 years in dating, as determined utilising the C14 dated sequence and chronology of the Ebrahimabad (Table 6.7, Section 6.3.4) exhibit similar microstructures.

On the other hand, considering the chemical compositions shown on Table 6.8, the Sialk II type pottery of Ebrahimabad show relatively similar compositions, except some Sialk II type pottery, e.g. the last two samples which exhibit distinctly lower CaO content. All of this type of pottery also possessed similar major mineral phases as the Sialk I type (Quartz and Augite minerals), plus a Hematite phase and SEM elemental map showed no difference between content of iron on the interior and exterior of the specimens (Figure 6.30 and Table 6.10 Chapter Six, Section 6.3.4). Hence, there is no red iron rich coating present on the outer surface of the Sialk II type red pottery of Ebrahimabad.Therefore, it can be suggested that the main factor responsible for the change from the buff-colour vessels to the red wares, Late Neolithic II to Transitional Chalcolithic (Early) period, was the more efficient control of the firing process. Because in an oxidising atmosphere Hematite crystals may be formed which is responsible for the red colour of pottery, without the mastering of firing techniques, such as the accurate control of firing temperature and atmosphere the production of the red pottery could not have been achieved in Ebrahimabad.

Moreover, it should be stated that the efficient control of the temperature and time, i.e. maintaining the required degree of oxidising atmosphere and observation of the appropriate time-temperature schedule during the firing of pottery could result in the elevation of the firing temperatures and the occurrence of more efficient sintering and vitrification processes. This would give rise to denser and stronger red pottery hence, the production of bulk red pottery, the pottery which are of red colour both on core and surface, in addition to the possible aesthetics considerations, are of prime importance in producing more dense impermeable and strong pottery.

Pardis site

The stratigraphic sequence and chronology of Pardis site, as determined by the absolute analysis, are shown in Table 6.11. The gradual evolution of pottery-making at Pardis from the buff pottery of Sialk I type (Late Neolithic), dated in the ranges between 5600-5200 and 5310-5080 BC, to the red pottery of early Transitional Chalcolithic in the ranges between 5280-5050 BC and 4830-4680 BC can be seen on the table. As mentioned above, all the Sialk I type pottery sherds from Pardis have similar chemical compositions and almost all of them are mainly composed of minerals such as Quartz and Augite (Calcium Aluminium Iron Magnesium Silicate), which is similar to the Augite mineral at Ebrahimabad. These pottery sherds also exhibit very similar microstructures (Figures 6.33-6.37). Therefore, over a period of 300 to 350 years (Table 6.11), Pardis site exhibited little change in the methods and techniques of pottery production in terms of raw material resources and firing technology.

However, the chemical compositions of Sialk II type specimens from Pardis show the existence of two different type of pottery, calcium- rich and calcium- poor, each group having homogeneous compositions within themselves. While the calcium- rich specimens were mainly composed of the same minerals as the Sialk I type specimens, the specimens poor in calcium possessed Quartz, Hematite and another major phase, structurally similar to a Orthopyroxene mineral (Iron Magnesium Calcium Silicate) with the following formula: ($Ca_{0.043}Fe_{0.802}Mg_{1.155}O_6Si_2$ CPDS card No. 01-086-0163).

Moreover, the specimens containing less calcium, because of their higher content of SiO_2 and lower CaO, are more refractory in comparison with the Sialk I type pottery from the same location and also exhibited quite dense and vitrified microstructures (Figures 6.38-6.40). This reveals that they have been fired at higher temperatures in comparison with the Sialk I type pottery from Pardis. The SEM elemental map showed no difference between the content of iron on the interior and outer surface of the specimens, indicating the absence of the red coating on their surface as discussed above (see Table 6.14). It was also observed that 50 % of the Sialk II type, red pottery specimens, are distinguished by the red colour of their surface and buff colour of the core. The remaining 50 % of the samples were of red colour both on the core and surface. It should be noted that the latter sherds all possessed relatively lower content of CaO (Table 6.12). Therefore, it can be proposed that the change from the buff-coloured, Sialk I type vessels to the well-made dense and strong red pottery of Sialk II type could have been achieved through a more careful selection of raw materials and better mastering of the firing techniques by exercising a more precise control on the firing temperature, time and atmosphere, which were only possible by constructing relatively advanced kilns. These all ascertain the existence of a high degree of specialisation in the pottery-making at Pardis during that specific time period.

It is interesting to note that Fazeli et al. (2010) also reported changes from the apparently softer, buff-coloured painted vessels of the Late Neolithic to the distinctively harder red-slipped and black-painted wares of the Transitional Chalcolithic at the Tepe Pardis. According to the authors, the production of the two aforementioned type of pottery did not involve different raw materials or higher firing temperatures but probably required longer times of firing and a more efficient and ingenious control of the firing process. According to our new research presented here, this is only true for the first group of the Sialk II type, red-surface pottery, whereas the production of pottery which was of a red colour both in the core and surface, usually accompanied by the use of low calcium clays (differing from the calcium rich clays used in production of the buff pottery) and more oxidising atmosphere that usually result in higher temperatures. Moreover, only the latter type of pottery could be highly impermeable with sufficient hardness, strength and density.

7.4.4 Craft specialisation and standardisation of pottery-making

Background

Obviously, first the term “’craft specialisation” should be defined in order to avoid confusion in the scientific discussions and exchange of information and ideas. Rice (1981: 220) defined specialisation as “regularised behaviour and material variety in extractive and productive activities”, while Tosi (1984: 23), defined it as “the variability in output per captia for a given product within the population sampled” and Costin (1991: 3) suggested the description of “the regular, repeated provision of some commodity or service in exchange for some other” for the term. Also Cross defined specialisation as “a situation in which a relatively large portion of the total production of a given item or class of items is generated by a small segment of the population” (Cross 1993: 65).

According to Tosi (1984: 49) craft specialisation is a powerful means that by creating various forms of labour and relative incomes or dependence of rural population on centre plays a crucial role in initiation of economic inequality (ibid.). It is known that the patterns of craft activities within segmentary societies will usually be organised on a form of self-sufficient mode of household production, while the more complex societies generally are arranged on a more centralised mode (Rice 2015; Costin 1991; Wason 2004).

Hence, it can be inferred that there is a relationship between craft specialisation and cultural complexity and a number of different theoretical approaches have been suggested by archaeologists to study this relationship (Childe 1951; Tosi 1984; Brumfiel & Earle 1987; Shanks & Tilley 1987; Clark & Parry 1990; Cobb 1996; Costin 1996; Pollock 1999). According to Childe (1950, 1951), the evolution of complex societies required technological progress and the production of food surplus hence, historically craft specialisation occurred when human society had mastered subsistence techniques and could produce surplus which was necessary to support government bureaucrats, social elites, craft specialists, and other non-food producers that characterise complex societies. In this approach, it was supposed that a further division of labour could foster an increase in population density, which would result in the creation of cities as centres of industry and trade, the population of which was mainly composed of specialists. These economic achievements might later led to 'Urban Revolution'. Childe also postulated that craft specialists were withdrawn from food production and were supported from this common store of surplus food (Childe 1951: 116).

It seems that more complex societies have also more complex divisions of labour, especially in the field of craft production, and there is a close relationship between the degree of craft specialisation and cultural complexity. Craft specialisation involves the transfer of goods from the producers to nondependent consumers, if the producers and consumers are members of the same household, then production couldn’t be considered as specialised production (Clark & Parry 1990: 297-98). Specialisation involves economic differentiation as well as some individuals who are mostly interdependent with each other who produce goods or services for a broader consumer population. Many classes of material culture may be produced by specialists, for example items that require complex production facilities, knowledge of complicated production process, access to some raw materials, or items which require high investments of time and effort (Cross 1993: 65). There are different types of specialisation, amongst them the kinds of specialisation which are related to the archaeological studies are:

Site specialisation, resource specialisation and producer (craft) specialisation (Rice 2015, 1991; Stark 1991).

In full-time specialisation a person does not produce any goods other than the given goods related to his/her specialisation, or the craftsmen produce a particular craft all year round (Pool 1990: 108). Individuals living in a society may specialise in the production of certain goods, but sometimes larger groups of households become engaged and specialise in one or more alternative "community-based" productive activities because of the insufficient output of the usual traditional agricultural activities. (Stark 1991: 65). The differentiation between full-time and part-time specialisation in the archaeological record sometimes isn't easy. Rice (1991: 263) suggested that this can be attributed to either functional specialisation depended on paste composition, or development of localised styles in settlements using different ceramic materials". In areas where such functional specialisation occurs, the possible determination of the time of its development and subsequent history would be interesting.

In regard to other aspects of craft specialisation Clark and Parry (1990: 298) also raised two questions: why does the specialist produce goods and who owns the goods. They suggested two possible answers to these questions. Either the producer has rights of alienation over what he/she produced or someone else does. In the first case specialised production is independent specialisation, but in the second case when an outside sponsor controls the finished goods, it is attached specialisation. In the latter case the sponsor retains rights of allocation and authorisation, or rights to the product and the specialised labour and the loyalty of the artisan. Thus, attached specialisation has strong economic and political aspects. Stein (1996: 25) stated that the productive organisation of attached specialists is structured by political factors, namely the goals, needs, values, and decision making strategies of a small group of patrons. Contrary to this, the independent specialists operate autonomously producing goods or services in response to economic, social, or political demands from a variety of sources.

It was also noted that production and specialisation are not the same things, the production is the transformation of raw materials and/ or components into useable objects, while the specialisation is a way to organise this production. The characteristics that distinguish the specialisation from non-specialised production are the amount of time spent in the activity and the proportion of subsistence obtained from the activity (Costin 1991: 3). The latter author has also identified four parameters that can be used to describe the organisation of production: context, concentration, constitution and intensity. The context of production (attached or independent) focuses on either political or economic explanations for the development of specialisation in a particular case. The concentration of production determines the special relationship between producers and consumers and the constitution of the production describes the group size and social relations of those individuals who regularly took part in the production of a recognised amount of goods, while the intensity of production shows the relative amount of time that the individual producers spent in the craft production relative to other economic activities.

Scale of production

Difference in scale of production is a useful means to distinguish between variants of craft specialisation, particularly between part-time and full-time specialisation. It may be applied equally to the production system as to the outputs of a system. The scale (level of input and output) of production responds to changes in the demand for products, the number of production entities (i.e. household, workshops, or factories), the availability of resources, availability and organisation of labour, and manufacturing technology (Pool 1992: 279). Rice defines the scale of production as the level of labour, resources and quantity of output (Rice 2015: 180) while, Costin defines it as a parameter which describes the composition of the production unit (Costin 1991: 15) and encompasses two related variables of the size and principles of labour requirement. Pool (1992: 279) also suggests that the size (i.e. the spatial extent) reflecting the actual number of individuals working in a single production unit, strongly influenced by the scale of production depending on the way that activities are organised spatially. Small villages are not strongly integrated into broader regional economics and craft production may be pursued primarily for “own use” or for irregular household exchange and consumption, i.e. production may be sporadic, on a seasonal or occassional basis.

Mode of production

Mode of ceramic production has attracted the attention of many archaeological researchers for several decade. A mode of ceramic production represents a distinct set of social relations between producers and between producers and consumers. Modes differ in terms of scale of production, or quantities of labour and resources used, as well as quantities of vessels produced (Rice 2015: 80-6). Therefore they differ in degree of intensification of production, or increased efficiency in production for the purpose of increased yields (Rice 2015: 190).

According to the evolutionary model for ceramic production, the mode of production gradually evaluated from part-time specialisation to full-time specialisation (Flannery 1972; Wright 1977, 1978) and as Rice (1981: 223) stated during this evolution there should be a change to a more complex mode over time, and it is expected that mass production would be developed in stratified societies.

In order to understand and explain the evolution of complex societies, the study of the mode and organisation of production have been the subject of significant archaeological research for several decades and a number of models have been developed to describe the organisation of production (Van der Leeuw 1977, 1984; Peacock 1981, 1982; Stark 1985; Rice 2015; Costin 1991; Arnold 1991; Underhill 1991; Clark & Parry 1990; Costin & Hagstrum 1995; Clark 1995).

The investigations have been made on the basis of organisation of labour, characteristics of vessels such as standardisation and diversity, as well as from direct evidence for production (Rice 1981, 1987: 202-5, 1989).

Peacock (1981, 1982: 8-10) and Van der Leeuw (1977, 1984) have suggested four modes of ancient pottery production:

Household production, household industry, individual workshop industry, and nucleated workshop industry.

In household production, a simple pottery-making technology is used by part-time potters and the products are mainly for household consumption. This type of production system is usually oriented toward self-sufficiency, with little opportunity for intensification (Rice 1987: 184). Household potters spend relatively little time in their production activities and do not employ specialised production techniques. The variability within household production is because of the infrequency of the activity, the low amount of products and little control over obtaining the necessary resources and information (Rice 1991: 273).

In household industry like household production, a simple technology is practised by part-time potters, however production is conducted more frequently and is directed towards a larger consumer market (Arnold 1991: 92). Because of the factors such as poor agricultural land, more families try to supplement their incomes by making pots (Underhill 1991: 13). The household industry can be considered as the beginning of commodisation in which pottery acquires exchange value in addition to use value and is made for someone outside the immediate environment (Rice 1987: 184). In the household industry production becomes more regularised and is generally conducted on a seasonal basis.

In individual workshop industry, production is conducted by full-time potters and a more advanced and complex pottery-making technology is used with a significant capital investment in kilns, moulds, wheels, etc. Workshops are usually isolated, and are mainly designed to supply goods to a large number of consumers. According to Arnold (1991: 92) the increase in the production output is related to the desire to improve the operational efficiency of manufacturing activity that can be achieved by specialisation and improved activity scheduling.

In nucleated workshop industry, pottery-making is a major economic activity, conducted in “clustered industrial complexes” with extensive technological investment. In this system though the production may be seasonal, but because of competition it is usually conducted year-round. In this mode of production the products are fairly standardised and of high quality (Rice 1987: 184).

This type of production is characterised by high volumes of output in which the products are made for a supra-regional market (Arnold 1991: 94). In both type of workshops, individual or nucleated, there usually exists explicit division of labour in which the workers are specialised in various production activities who work in separate special production areas (ibid.).

Three of the aforementioned four modes of production are applicable to the prehistoric chiefdoms: household, household industry, and individual workshop industry, but the nucleated workshop industry, is usually associated with urbanism and fully developed market economies (ibid.).

However, there are problems in identifying modes from archaeological remains. A major difficulty is that few test implications have been developed on the basis of ethnographic data (Rice 1987: 204-5). Mode of production is often more difficult to identify in less complex societies.

Underhill (1991) suggested to subdivide the term 'household industry' into 'simple household industry' and 'complex household industry'.In the simple household industry like household production a simple pottery-making technology is used by part-time potters and the products are mainly for household consumption but usually higher degree of specialisation and higher quality vessels were produced in greater numbers. While, complex household industry' is similar to the individual workshop where pottery-making is a major source of income, but contrary to the individual workshop industry where production is carried out in workshops, in 'complex household industry' the houses are also used as production centres. The individual workshop industry mode is also characterised by greater intensification of production (Underhill 1991)

Three categories of data are potentially useful for identifying change in mode of ceramic production: pottery vessels (standardisation, diversity), direct evidence for production such as kilns, and techniques of production. Conclusions are more secure when they are based on more than one line of evidence.

Efficiency

The crucial consequences of specialisation are the increased efficiency of production which is defined as a relative measure of time, energy and raw materials that are used in production per unit of output (Costin 1991: 37). Some of the most important ways of increasing the efficiency are more Sophistication in technology, simplification and standardisation of production system and products, spatial separation of production stages and economic use of the available high quality raw materials (Forenbaher 1999: 19). Arnold (1991: 91) stated that the level of output is mainly based on four variables:

The number of individuals engaged in production activities, the amount of time devoted to production activities, the available technology and the cost of raw materials.

The greater efficiency apparently reduces the production cost of goods produced in a given time. According to this definition, a positive association between production efficiency and vessel standardisation as well as a positive relationship between market competition and energy investment can be found (Arnold 1991: 95). In the study of efficiency, the two subjects of competition and labour investment should be considered. High efficiency is considered as an essential factor for effective survival of a specialised system (Costin 1991: 37). When systems become more specialised, they become less competitive because there are fewer producers which could compete with them. In these conditions, their energy consumption is lower, mainly because there is no need to produce great number of superior products because of relatively small number of the consumers. Contrary to this, in the less specialised production which is usually more competitive, the energy consumption is higher since the specialists in order to differentiate their wares from the products of their competitors and attract more customers try to produce higher quality products (ibid.).

Standardisation

Today, standardisation is an important subject in archaeological studies and the most fundamental consequences of specialisation are the efficient techniques, standardised products, and increased output which are of great economic importance (Clark & Parry 1990: 293). One of the most common and effective ways in the archaeological studies to recognise the goods produced in mass quantities by specialists is their high degree of standardisation. Standardisation reflects the reduction of variability; hence ceramics within each category of pottery exhibit little heterogeneity in composition and appearance, however, standardisation has many diversified aspects such as homogeneity in ceramic materials, vessel shapes and decoration. It also encompasses all aspects of manufacturing process, such as resource selection, processing, forming, finishing, and firing, as well as the organisational aspects of production like scale and mode. Hence, in the archaeological studies the increased scale of specialised production can be detected by examining the manufacturing facilities, exchange pattern and the degree of standardisation in the physical and stylistic characteristics of the goods (Blackman et al. 1993: 61). For example, Blackman (Blackman et al. 1993) considered the high degree of standardisation and/or homogeneity in vessel dimensions reflects specialised mass production, while variation or relative heterogeneity in dimensions indicates household production. Some archaeologists in their explanation concerning the difference between the standardisation and homogeneity terms, stated that standardisation is a relative degree of homogeneity or reduction in variability in the characteristics of an artefact (ibid.). Cross (1993: 71) defined uniformity as "repeatedly achieving sets of proportions or a combination of traits within an artefact population".

Highly standardised products indicate that production is carried out by individuals who utilised a limited range of materials and some routine techniques resulting in almost identical products, e.g. mass production by moulds (Rice 1987: 202). Standardisation of production does not necessarily imply that only one kind of pottery is made and used in a community. It indicates that little heterogeneity in composition and appearance (form and style) is observed within each category of pottery. The specialised production, means that a small number of skilled producers manufacturing pottery will observe the principles of cost effectiveness, quality control, and mass production, to produce homogenous or standard pottery (Rice 1987: 202).

Several factors have been proposed to observe and explain the trend toward standardisation in specialised craft production, especially ceramic manufacture. Arnold and Nieves (1992: 93-113) noted that standardisation should ideally refer to the same tradition, hence, the products of one area in a given period shouldn't be compared with the products of another area. They suggested comparing one population of potters at two points in time, which could provide some information about changes in standardisation (ibid.: 93). Standardisation is an indicator of ceramic specialisation and is related to cultural evolution, and a more standard assemblage may follow a less standard assemblage in time. For example, it seems that increasing demand is one of the important factors affecting variation in manufacturing techniques, and reduction in the labour invested in each vessel are often accomplished by standardising vessel classes and use of more sophisticated production methods, such as moulds and the potter's wheel, or simplification in the motifs (Pool 1992: 285). Feinman (1985: 299) suggested that an increase in the scale of pottery production has usually been accompanied with greater vessel standardisation and Rice (1991: 268) proposed that standardisation can emerge through the radical or conservative tactics of craft specialists, for example some potters may adhere to known resources and manufacturing procedures. The greater standardisation of goods produced by specialists may also give some information concerning the social status and group affiliation within complex societies (Blackman et al. 1993: 61). Rice (1991) also suggested that specialised production of ceramics in archaeological assemblages may be attributed to the standardisation of raw material compositions or alterations made in use of particular kinds of clays, tempers, manufacturing techniques, form, dimensions and surface decoration.

7.4.4.1 Craft specialisation and standardisation of pottery-making at the three sites

I. Specialisation and standardisation at Sialk

Considering the course of evolution in pottery-making at Sialk, as discussed in Section 7.4.3, now it can be speculated that the first stage of the development in pottery-making industry at the oldest phase of Late Neolithic, characterised by the low quality and quantity of the products and sluggish course of development can be assigned to the household production as already explained above in Section 7.4.4. While the second stage of development between the earlier and later phases of the Late Neolithic period, before entering the Transitional Chalcolithic period during which a faster course of development and higher quality and quantity of the products were observed can be assigned to the 'simple household industry'.

However, the pottery industry witnessed a very distinct change from the Sialk I to Sialk II by producing bulk red pottery, which are red both on surface and core. The production of this pottery was an event that can be evaluated as a breakthrough in the process of evolution of the pottery-making at Sialk. The production of these Sialk II pottery involved a radical change in the selection of resources as well as in firing techniques and the elevation of firing temperature. Indeed, the change of the raw materials resulted in more refractoriness of the pottery material, necessitating a much higher firing temperature. It also necessitated more precise control on firing atmosphere, using more oxidising atmosphere to produce completely red pottery, as well as by exerting a more precise control on the time-temperature relation during the firing process. This would have resulted in products of much higher quality, which would be denser, less porous, stronger, less fragile and less permeable to liquids such as in the sample S2p shown on Figure 6.10. Producing such pottery wares must have been accompanied by a quite high degree of specialisation in the selection of materials and mastering of the firing techniques by the potters of Sialk during this time period.

Although no kilns were discovered during the excavations in Sialk, perhaps because of the limited extent of the excavations carried out, the strict control exerted on the firing atmosphere and temperature, as well as the observation of the careful time-temperature relation during the firing process of pottery at the later stages of the Sialk II period, would had been impossible without the use of relatively sophisticated kilns at Sialk during that specific time period.

Despite the facts that no specific areas or workshops were recognised, and the direct evidence of use of complex pottery-making technology such as kilns, moulds, wheels, etc. were not found at Sialk, but the large quantity and high quality of the Sialk II type pottery recovered from the site, exhibiting quite remarkable resemblance with each other regarding their form, decoration as well as their chemical/ mineralogical compositions, as confirmed by the Principal Component Analysis (PCA) carried out on the XRF chemical composition data of Sialk I and II pottery samples (Figure 6.1) which exhibited the considerable clustering of the pottery compositions encompassing the Sialk I, as well as Ca-rich samples of the Sialk II period, distinctly distinguishable from the cluster of Ca-poor samples of the Sialk II period, all witnessing the existence of a certain degree of specialisation and standardisation in pottery-making, the mode of complex household industry could be assigned to the pottery production at Sialk in theTransitional Chalcolithic period.

II. Specialisation and standardisation at Ebrahimabad

On the basis of the experimental results obtained in this study, the occurrence of an apparently gradual development in pottery-making technology at the site of Ebrahimabad can be ascertained in the late Neolithic through the transitional chalcolithic periods (from ~ 5500 to ~5000 BC). This development mainly occurred in the field of more efficient control of the temperature and time in order to maintain the required degree of oxidising atmosphere within an appropriate schedule. Hence, the existence of considerable knowledge, experience and skill in mastering the firing techniques amongst the potters of Ebrahimabad enabled them to produce high quality wares, which were red both on surface and core between 5060 and 4882 BC. However, due to the limited number of the studied samples, especially the youngest samples of pottery from the site, it is not possible to make definite conclusions concerning the degree of specialisation in the selection of materials and mastering of firing techniques in order to produce the red pottery during that time period. Finally, considering the relatively small size of the mound of Ebrahimabad, the limited extent of the excavations carried out on the site and relatively low number of the studied samples, despite the observation of the aforementioned continuous and gradual development of pottery production and the similarity of the products belonging to each period regarding their chemical/ mineralogical compositions and microstructures, it is not possible to draw solid, precise conclusions regarding the level of standardisation and mode of pottery-making at Ebrahimabad. However, pottery production modes at Ebrahimabad could tentatively be evaluated as household production and simple household industry in the late Neolithic and Transitional chalcolithic periods, respectively.

This observation was also confirmed by the Principal Component Analysis (PCA) carried out on the XRF chemical composition data of Ebrahimabad I and II pottery samples (Figure 6.18) exhibiting the considerable clustering of the pottery compositions including the Ebrahimabad I, as well as Ca-rich samples of the Ebrahimabad II period, distinctly distinguishable from the cluster of Ca-poor samples of the Ebrahimabad II period.

III. Specialisation and standardisation at Pardis

It may be speculated that the change from the buff-colour Sialk I type vessels to the well-made dense and strong red pottery of Sialk II type could only have been achieved through the more careful selection of raw materials and better mastering of the firing techniques by exercising a more precise control on the firing temperature, time and atmosphere, which were only possible by constructing relatively advanced kilns. Moreover, the large quantity and high quality of the Sialk II type pottery recovered from the site, exhibiting quite remarkable resemblance with each other regarding their form, decoration as well as their chemical/ mineralogical compositions as confirmed by the Principal Component Analysis (PCA) carried out on the XRF chemical composition data of Pardis I and II pottery samples (Figure 6.31). The plot exhibited the considerable clustering of the pottery compositions encompassing the Sialk I, as well as Ca-rich samples of the Sialk II period, distinctly distinguishable from the group of Ca-poor samples of the Sialk II period which showed considerable scattering. These all evidenced the high degree of specialisation and standardisation practiced by the potters of pardis during the time period under study. It has also been suggested that during the Transitional Chalcolithic period (5200-4600 BC), the residential part of the site or domestic space was separated from the workshops area and the whole workshop area of 400 square metres was constantly used for making vessels. Indeed, all the excavated layers contained kiln remains and other artefacts related to ceramic manufacturing (Fazeli et al. 2007a).

This would imply a permanent ceramic production centre from the end of sixth into the first half of fifth millennium BC. Another example of direct evidence for the mass production and specialisation of ceramic production is the use of multi-chambered kilns in the firing process, which is very important for studying the standardisation of ceramic production (Fazeli et al. 2010, 2014). In addition to ceramic vessels manufactured at Pardis, a large number of other artefacts such as spindle whorls, slingshots and beads were also recovered from the site indicating the existence of considerable speciality in using the main available resources of the site, namely clays, to produce a variety of artefacts (Manuel et al. 2014). Moreover, positive evidence was found at Pardis for the use of fast potters' wheels (Fazeli et al. 2007a, 2010). Although this technique was used only to a very limited extent, the potters of Tepe Pardis were apparently familiar with this specialised technique and utilised it with clay mixtures of variable texture and also with different forms. Moreover, in regard to the forms of produced vessels it seems that the potters of Pardis in Period II abandoned or changed the quantity of certain type of vessels and produced new vessels trying to fulfil the changing needs of their communities in the fields of cooking, carrying, and storage of food or other applications that were related to the socio-economic change of the societies and their life style.

This observation was also confirmed by the Principal Component Analysis (PCA) carried out on the XRF chemical composition data of Sialk I and II pottery samples (Figure 6.1) which exhibited the considerable clustering of the pottery compositions encompassing the Sialk I, as well as Ca-rich samples of the Sialk II period, distinctly distinguishable from the cluster of Ca-poor samples of the Sialk II period.

On the basis of the scientific analysis carried out in this thesis, as well as the excavated findings (Fazeli et al. 2007a, 2010, 2014), and considering the points already discussed above in Section 7.4.3., it can be suggested that Tepe Pardis functioned as a specialised pottery-producing centre, performing at a level of “individual workshop industry” in Transitional Chalcolithic period. In individual workshop industry, production is conducted by full-time potters and a more advanced and complex pottery-making technology is used with a significant capital investment in kilns, moulds and wheels. Workshops are usually isolated, and are mainly designed to supply goods to a large number of consumers. According to Arnold (1991: 92), the increase in the production output is related to the desire to improve the operational efficiency of manufacturing activity that can be achieved by specialisation and improved activity scheduling.

7.4.5 The comparison of production technology of the Pardis and Sialk pottery

The comparison of pottery of the same traditions from the two major sites of Central Plateau, Sialk and Pardis, revealed no distinct similarities in chemical/mineralogical composition, and the details of the technology of pottery indicating the absence of long distance trade, and direct exchange of ceramic articles or production technology, as well as resources between the aforementioned sites in the Late Neolithic and Transitional Chalcolithic periods.

This observation was also confirmed by the Principal Component Analysis (PCA) results carried out on the XRF chemical composition data of Sialk and Pardis pottery samples (Figures 6.36 and 6.37). From these figures it can be deduced that each of the pottery sample collections of Pardis I, and Sialk I exhibited considerable clustering within themselves, which were clearly distinguishable from each other (Figure 6.36). On the other hand, the PCA plot of the collections of Sialk and Pardis II samples (Figure 6.37) showed the occurrence of a discrete clustering within each of the Ca-poor sample groups, which were again clearly distinguishable from each other, while the Ca-rich samples of Sialk II exhibited considerable scattering in contrast to Ca-rich samples of of Pardis II which showed a certain degree of clustering. However, the aforementioned Ca-rich samples of Sialk and Pardis II were distinguishable from each other.

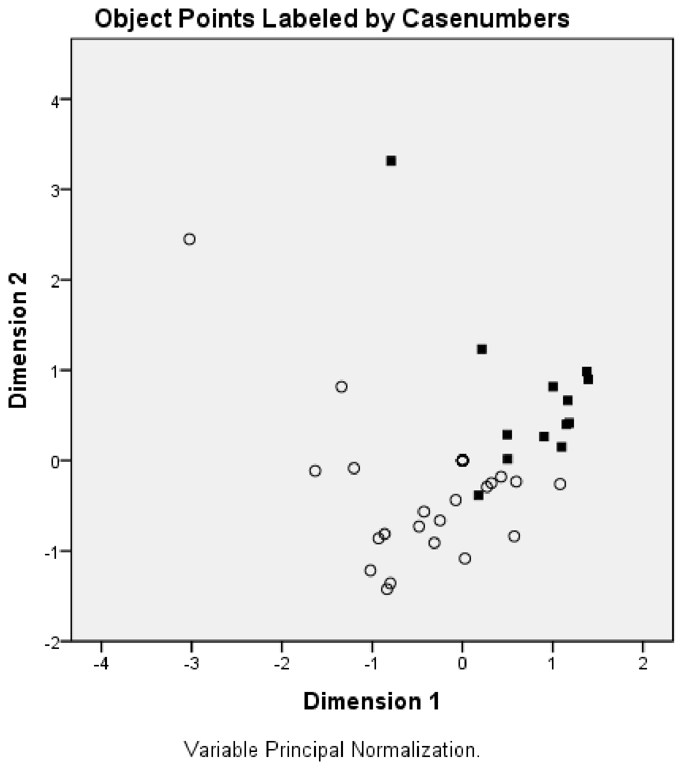


Figure 7.36 PCA of Sialk I and Pardis I Ware samples. The site abbreviations are as follows: ■ Pardis I (n = 12), O Sialk I (n = 22).

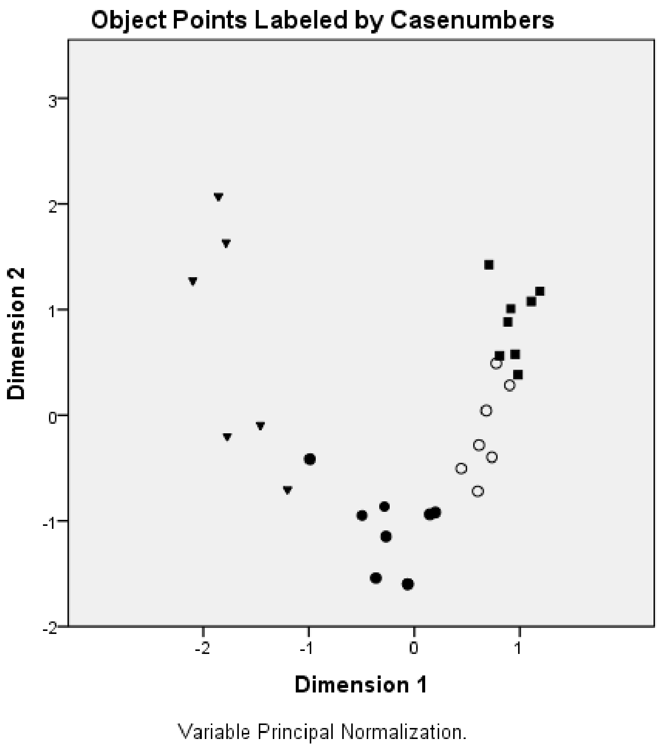


Figure 7.37 PCA of Sialk II and Pardis II Ware samples. The site abbreviations are as follows: ● Ca-rich Pardis II samples (n = 8), ▼ Ca-rich Sialk II samples (n = 6), ■ Ca-poor Pardis II samples (n= 8), O Ca-poor Sialk II samples (n = 8).

7.5 Conclusion

This chapter has presented the discussion of data on the analysis of form and decoration of pottery, typological classification and phylogenetic reconstruction methods as well as discussion of scientific analyses, chemical-mineralogical composition and pottery microstructure of pottery obtained from the application of XRF, XRD, SEM/EDX techniques. These discussions present greater detail on production technology, the course of evolution in pottery-making as well as the specialisation, standardisation and the production mode of pottery-making for each site and period. They also begin to highlight the implications for the socio-economic changes and the existing economic and cultural connections and interactions of the prehistoric communities living in the Central Plateau of Iran during Late Neolithic and Transitional Chalcolithic periods. The information presented in this chapter, together with the results of data analyses presented previously in Chapters FIVE and SIX, will serve to complete the fulfilment of the Objectives Three, Four and Five of the present thesis. The next chapter will now draw a general conclusion relating to the thesis in order to demonstrate how its overall aim and objectives have been achieved as well as explaining the significance and contribution of this research to archaeological knowledge of the Central Plateau of Iran and its economic and cultural development as well as the connections and interactions of the prehistoric communities living in this region between the Late Neolithic and the Transitional Chalcolithic.

Chapter 8: Conclusion

8.1 Introduction

The aim of this thesis was to introduce new insights concerning our understanding of the socio-economic transformation of Neolithic and Chalcolithic settlements within the Central Plateau of Iran and to pursue this aim through the study of the evolution of ceramic craft specialisation between ca. 5700-4800 BC. It was further proposed that providing additional information in this area could lead to a better understanding of the chronology and cultural-technological development of this region, as well as the economic and cultural connections and interactions of the prehistoric communities living in the Central Plateau. Specifically, the objectives of this research were:

1. To geographically contextualise the Central Plateau of Iran and provide additional information concerning its palaeoenvironmental background.

2. To review the prehistoric periods, phases and ceramic traditions attributed by archaeologists working in this region in order to understand current chronological banding.

3. To undertake a typological classification of the ceramics collected from three sample sites within the Central Plateau of Iran.

4. To undertake cladistic methods of phylogenetic reconstruction of the data sets comprising the decoration and pottery form from three samples sites within the Central Plateau of Iran.

5. To undertake analysis techniques (XRF, XRD, SEM/EDX) to scientifically characterise the pottery sherds from three sample site within the Central Plateau of Iran.

8.2 The geographical and Palaeoenvironmental background of the Central Plateau of Iran

Objective one was achieved by the presentation of geographical and palaeoenvironmental background in Chapter Two in which the Central Plateau, which covers nearly one third of Iran, was broadly divided into three geographical regions: the mountains, deserts and the plains. It reiterated that the plains are the most important regions for studying the prehistory of the Central Plateau of Iran as major agricultural and urban settlements dating from the Neolithic to the historic period were located in these regions. Noting that the plains are mostly covered by water-transported alluvial sediments, alluvial fans were identified as the most extended sediments in the plains, representing fan-shaped deposits which are formed where a fast-flowing stream flattens, slows down and spreads, as at the exit of a valley onto a flatter plain. They are the main site of deposition in areas, in which mountains gradually wear away, through geological time and basins were filled with sediments (Wilkinson 2003). The water permittivity of alluvial fans is usually high, hence alluvial fans are often the principle groundwater source for farming and the possibility of creation of sustainable communities in arid and semiarid regions. They also contain rich soils, suitable for agriculture.

As the aim of this project concentrated on newly excavated pottery from three prominent sites located in the plains of the Central Plateau of Iran - Pardis on the Tehran plain, Ebrahimabad on the Qazvin plain and Sialk on the Kashan plain - the geographical and palaeoenvironmental background of the major plains of the Central Plateau of Iran was presented.

A Comparison of the regional distribution of settlement on the Tehran, Qazvin and Kashan plains

Archaeological studies of the plains of Central Plateau have shown that settlement patterns varied locally and were distinct to each plain (Marshall 2012: 446). Indeed, it appears that environmental factors probably contributed to differences in settlement patterns between the three plains and the most important aspect of prehistoric settlement was identified as instability of settlement sustainability. Fluctuations in the abandonment of sites, the emergence of new sites and increases and decreases of population were regularly repeated on the Tehran, Qazvin and Kashan plains throughout the Mid-Late Neolithic (ca. 6500-5500 BC) and Chalcolithic periods (ca. 5500-3000 BC). Very few long-lived settlements are known from the Central Plateau, the exceptions being Cheshmeh Ali, Tepe Pardis and Mafinabad on the Tehran Plain and Tepe Sialk on the Kashan Plain. Significantly, all of these are or were associated with permanent water sources. For example, a spring has been located in the vicinity of Tepe Sialk and there is direct evidence of the existence of an artificial water channel at Tepe Pardis, which appears to be the earliest use of irrigation technology in Iran (Gillmore et al. 2007, 2009, 2011). This undoubtedly played a major role in the location of a highly specialised settlement at this point, in addition to the proximity to the clay resources for ceramic production and there is direct evidence of the existence of an artificial water channel at Tepe Pardis, which appears to be the earliest use of irrigation technology in Iran (Gillmore et al. 2007, 2009, 2011).

Manuel et al. (2014) also suggested that contrary to some theoretical models in archaeology that consider the external factors as the only causes of the past cultural changes in societies, in the modern Processual archaeology the focus has shifted from external factors to internal factors based on the continuity and sustainability of societies instead of change. They also commented that rather than considering the past societies as victims of environmental, social and political factors, we should try to see the attempts of past societies to survive by management of their landscape, development of new technologies and finding new resources and when necessary abandonment of their living areas. According to the authors, the most important obstacle in the development, continuity and sustainability of the early societies living in Central Plateau of Iran has been access to permanent water sources.

The existence of an artificial irrigation channel at Pardis, as explained above, and discovery of changing pattern of river management during the Chalcolithic at Sialk, as evidenced by the existence of successive layers of deposits comprising the natural alluvial deposits at the bottom and alternating phases of cultural occupation and finer alluvial deposits at top, possibly representing phases of reduced river flow during which occupation is evident, demonstrate that how past human communities have attempted to preserve their long-term survival by trying to manipulate their environment.

8.3 Review of Prehistoric Archaeological research of the Late Neolithic and Transitional Chalcolithic periods in the Central Plateau of Iran.

Objective Two of the thesis was achieved by the review of prehistoric archaeological research in the Late Neolithic and Transitional Chalcolithic periods in the Central Plateau in Chapter Three. This review confirmed the prehistoric periods, phases and ceramic traditions attributed by archaeologists working in this region in order to understand current chronological banding. It reiterated that since the 1930s many archaeologists have been engaged in the study of historical, cultural, technological and socio-political development of the Central Plateau and a number of chronological models have been proposed. Earlier studies by Ghirshman (1938); McCown (1942); Dyson (1965, 1987) and Majidzadeh (1976) were largely culture-historical and focused predominantly on stylistic changes in ceramics. They relied almost exclusively on decoration and the pottery shape and mostly ignored basic technology.

For example, Ghirshman, who was one of the first archaeologists to conduct systematic archaeological investigations in the Central Iranian Plateau used similarities between pottery designs to define four main phases for the site and divided the North Mound, which contained the earlier cultural deposits of the Late Neolithic period, into two main phases - Sialk I and Sialk II. Sialk I, belonging to the Late Neolithic period, mostly contained the pottery possessing coarse buff body with black painted decoration whilst Sialk II, belonging to the Transitional Chalcolithic, comprised red pottery, painted in black. Ghirshman's periodisation and the chronological differentiation of pottery based on the colour and decoration at Sialk has strongly influenced the work of subsequent researchers and continues to be used by them as a key cultural and chronological marker for the interpretation of the late prehistoric chronology of the Central Plateau of Iran.

Based on the ‘type of pottery’, which was defined according to their appearance (mainly colour and decoration), the prehistoric chronology of Iran was initially divided into eight stages (Negahban 1996; 350). Majidzadeh (1981) then introduced a model to explain the changes in societies in the Central Plateau and suggested that prominent changes to societies in this region, such as the abandonment of settlements in some areas, was prompted by outside interference or invasions by the people who produced different type of pottery, as identified by their colour. Malek Shahmirzadi (1995) also proposed four stages for the cultural sequence of the Central Plateau based on characteristics of the excavated pottery and the production of certain pottery at some sites of the Central Plateau. Again, they were attributed to migration of people into the region who imported their ceramic manufacture to their new homes.

As is clear, all these propositions were simply based on the recovery of pottery with apparently novel and different colour/decoration in comparison with the existing ones. These traditional methods of the study of Iranian Central Plateau’s pottery have led to confusion and misunderstanding, particularly as pottery of similar colour and decoration has usually been classified and named with a single common name, e.g. Sialk I or II. Therefore, the similarity or differences between the characteristic of pottery belonging to different sites of the region, as well as the details of the product exchange, cultural interaction or technology transfer has been masked. It has also result in misunderstandings regarding the exact nature of socio-economic exchanges between various prehistoric societies, such as assuming the existence of an intrusive element from outside that brought about the changes in societies and abandonment of settlements in some areas of the Central Plateau (Majidzadeh 1981) or migration of some people into the Central Plateau who imported the ceramic manufacture to the region (Malek Shahmirzadi 1995).

The more recent excavations featured in this thesis, and the utilisation of scientific analyses methods of pottery, such as chemical analysis (ICP-AE), petrography and use of C14 dating provide a far more accurate and reliable understanding of the chronology and cultural development of the Central Plateau of Iran during the Late Neolithic and Chalcolithic periods. For example, the study of chemical composition of ceramic sherds from six Late Neolithic to Middle Chalcolithic sites on the Tehran Plain by (ICP-AE), utilising discriminant analysis method, revealed that the ceramics can be partially separated by site according to their chemical composition, indicating the use of similar but discrete local clay resources in each site (Fazeli, et al. 2001). Similarly, Wong, et al. (2010) studied Sialk II pottery utilising geochemical and petrographic analyses revealed that the studied pottery which were collected from several sites in the Qazvin and Tehran plains dated to the Transitional Chalcolithic period, exhibited different site dependant characteristics. These findings indicate the existence of local rather than centralised production in these regions during the Transitional Chalcolithic period, which are very important for understanding the specifications of the pottery production technology in this region regarding its level, extent and degree of specialisation.

Fazeli, et al. (2011) who carried out a paleo-technological study on the pottery sherds excavated in the site of Pardis in Tehran plain, further proposed that the change of the pottery type from the buff pottery wares of the Late Neolithic to the red wares of the Transitional Chalcolithic possibly did not occurred through the use of different raw materials or higher firing temperatures but through the use of longer times and more efficiently controlled firing conditions. The authors suggested that the initiation of this firing condition necessitated the use of sophisticated kilns which was discovered at the site. The authors also reported the possible use of an early fast potters' wheel at the same site, the early evidence of the use of fast wheel throwing in Pardis, underlining the key role of the early settlements of the Tehran plain in the development of socio- technical complexity across the Central Plateau. This study of the history of previous archaeological studies of Central Plateau of Iran provided very useful background information for pursuing the subsequent phases of this project.

8.4 The typological studies on the pottery collected from the Central Plateau of Iran

Objective Three of the thesis was achieved by undertaking a typological study of the pottery collected from the Central Plateau of Iran and discussed in Chapters 5 and 7. On the basis of these results, the following conclusions can be drawn concerning the typological characteristics of the pottery collections recovered from the three sites studied in this project. Altogether, the pottery assemblage of Sialk I recovered from Sialk presents a very wide range of forms (n=20) and it seems that Sialk II pottery, insofar as the forms are concerned, offer a continuation of the Sialk I tradition with a narrower range of forms. Indeed, 13 pottery rim forms out of the 15 forms of the Sialk II pottery have similar counterparts in the Sialk I pottery. However, it appears that the potters of Sialk in Period II experienced a higher level of specialisation and, by limiting or abandoning the production of certain sizes of vessels and producing new vessels differing in size with the existing ones or changing the quantity of certain products constantly, were trying to fulfil the changing needs of their communities.

It is also apparent that Sialk I type of pottery from Ebrahimabad and Pardis was developed under a strong influence from Sialk. In this respect, it should be noted that most of the rim forms of Ebrahimabad I and Pardis I pottery resemble Sialk I pottery rims from the site of Sialk site. However, it also seems that during the Sialk II period, this influence was replaced or evolved independently into more distinctive cultures, differing from Sialk II pottery. This is especially the case of Pardis, where out of the 19 different rim forms of Silk II type pottery, there were 14 common forms with Sialk II pottery from the site of Sialk. It is certainly interesting to note that out of the 15 different pottery rim forms of Sialk II period from the site of Sialk, there are only five common rim forms with Ebrahimabad and 14 forms with Pardis II pottery, whereas Ebrahimabad II pottery has 13 common rim forms out of Pardis II's 14. This indicated that Ebrahimabad II was under a stronger influence from Pardis II in comparison with Sialk II. It seems that in the later stages of its development, Pardis possibly grew to exercise a more advanced and larger community with the ability of exerting its influence upon other areas located in the Central Plateau of Iran.

8.5 Phylogenetic analyses of pottery decorations

Objective Four of the thesis was achieved by applying cladistic methods of phylogenetic reconstruction to the decoration and form of ceramics from the

Central Plateau of Iran as summarised in Chapters 5 and 7. As previously discussed in Section 7.3.1, the most parsimonious cladogram (Figure 7.25) indicated that Sialk I, Ebrahimabad I and Pardis I decorations all share a common ancestor and that Sialk II, Ebrahimabad II and Pardis II are descended from another common ancestor. The first three groups belong to Late Neolithic period and contained Sialk I pottery type and the second three belong to the Transitional Calcholitic period and comprised Sialk II pottery type. The Consistency Index of the cladogram is 0.58, and the Retention Index is 0.52.

This indicates that the decorations of Sialk I type pottery belonging to the Late Neolithic period recovered from all three sites are quite similar with each other. However, there is no similarity between the decorations of the Sialk I and II type of pottery belonging to the Transitional Chalcolithic period, while they exhibit close resemblances with each other. This is quite interesting observation, as the Sialk I and II type of pottery prove to have close relations and resemblance with each other in other aspects, such as form and production techniques.

8.6 Phylogenetic analyses of pottery forms

As previously discussed in Section 7.3.2, the most parsimonious cladogram (Figure 7.26) concerning the forms of pottery showed a Consistency Index of 0.58, and a Retention Index (RI) of 0.56. This suggests that the Sialk II is directly descended from Sialk I but that Pardis II and Ebrahimabad II cluster with the Sialk assemblages, instead of with earlier assemblages from those two sites. Hence, it can be inferred that Pardis II and Ebrahimabad II were more influenced by Sialk rather than their own earlier periods during the production of Sialk II ceramics. This may be attributed to the much older and far more developed and extended tradition of pottery-making at Sialk in the period of Late Neolithic. In fact, Sialk I pottery exhibited greater numbers of highly diversified type of well-made pottery. Therefore, it can be suggested that in the Late Neolithic period, the Sialk I tradition may have spread to Pardis and Ebrahimabad and replaced local traditions in fact the great majority of the pottery forms in Pardis I and Ebrahimaba I have similar counterparts in Sialk I. In the subsequent stages of their development in the

Transitional Chalcolithic period, Pardis and Ebrahimabad had a lack of strong local tradition and were under a strong influence of Sialk II and, in a more limited scale, even Sialk I. The latter tradition had possibly been an established tradition in these sites at the time of entering the Transitional Chalcolithic period. It is interesting to note that Ebrahimabad was under a stronger influence from Pardis II in comparison with Sialk II and it seems that Pardis, in the later stages of its development, exerted its influence upon other areas of the Central Plateau.

8.7 The development of pottery production, specialisation and standardisation in the Central Plateau of Iran

For identification of the production locations, production technology and production by-products two main sets of data can be used (Tosi 1984; Arnold 1991; Forenbaher 1999). The first set of data are direct evidence, such as production implements or production technology which can be identified in the excavation of actual pottery production centres are workshops, raw materials, moulds, kilns, firing pits, grinders, anvils and firing wasters. The most significant way of identification of the organisation of production is to find places at which production actually took place, i.e. workshops. The 'workshop' is not only a place where something is being manufactured, but it also reveals the specific social relationship between the producers and consumers (Forenbaher 1999: 16). When direct evidence cannot be identified, the second approach, namely, indirect evidence can be used to study by-products or production results, i.e. finished goods (Costin 1991: 32).

It is known that the patterns of craft activities within segmentary societies will usually be organised on a form of self-sufficient mode of household production, while the more complex societies generally are arranged on a more centralised mode (Rice 1987, 2015; Costin 1991; Wason 2004).

Hence, it can be inferred that there is a relationship between craft specialisation and cultural complexity and a number of different theoretical approaches have been suggested by archaeologists to study this relationship as already mentioned above in Section 7.4.4. According to Childe (1950, 1951), the evolution of complex societies required technological progress and the production of food surplus hence, historically craft specialisation occurred when human society had mastered subsistence techniques and could produce surplus.

Objective Five of thesis was achieved through the utilisation of the scientific analysis techniques, XRF, XRD, SEM/EDX, in characterising the pottery sherds collected from the three sites as discussed in Chapters Six and Seven, a brief summary of which is presented below for each site and period.

Sialk

As already stated above in Section 7.4.4.1 the direct evidence for specialisation in production of pottery such as specific areas or workshops, kilns, moulds, wheels, etc. were not found at Sialk; hence, indirect evidences can be used to study the aforementioned specialisation.

According to Costin (1991: 32), when there is a lack of manufacturing evidence, such as kilns, wasters, tools, and raw materials in the archaeological assemblage under study, finished objects can be utilised to identify the organisation of production. The production results or finished goods enable archaeologists to characterise pottery manufacture in term of the degree of product standardisation, design elaboration and possibly the overall amount of energy investment per vessel (ibid.).

There are different types of specialisation, amongst them the kinds of specialisation which are related to the archaeological studies are:

Site specialisation, resource specialisation and producer (craft) specialisation (Rice 1987, 1991; Stark 1991). Site specialisation, is defined as some localities or sites that have limited functions or intensive production activity and their concentration is determined by some accidental favourable environmental factors (Rice 1991).

Resource specialisation, which is usually related to the site specialisation, is defined as the selective use of particular resources of craft manufacture, e.g. certain clays that are mostly selected for production of certain products (ibid.).

Hence, considering the aforementioned discussion on the course of evolution in pottery-making at Sialk, (Section 7.4.1) it seems that site specialisation and resource specialisation was adopted at Sialk.

It has also been demonstrated that the characteristics of Sialk's pottery gradually evolved from the more fragile buff pottery of Sialk I to the same bodies covered with a red slip and eventually led to the high quality, fine and strong, red pottery of Sialk II. However, it seems that the course of this development in pottery-making was sluggish at first and, in the Late Neolithic period, however a faster course of development in pottery- making were observed later on, between the earlier and later phases of the Late Neolithic period.

However, the pottery industry witnessed a very prominent change from the Sialk I to Sialk II period by producing high quality bulk red pottery the production of which involved a radical change in the selection of resources as well as in firing techniques and the elevation of firing temperature. It also necessitated more precise control on firing atmosphere, using more oxidising atmosphere to produce completely red pottery, as well as by exerting a more precise control on the time- temperature relation during the firing process. This apparently resulted in products of much higher quality pottery, which were denser, less porous, stronger, less fragile and less permeable to liquids. The production of such pottery wares must have been accompanied by a higher degree of specialisation in production of pottery especially in the fields of the selection of materials and mastering of the firing techniques in Sialk II period.

As already mentioned in Section 7.4.4, four modes of production have been proposed for ancient pottery, on basis of organisation of labour, characteristics of vessels such as standardisation and diversity, as well as from direct evidence for production namely, household production, household industry, individual workshop industry, and nucleated workshop industry (Peacock 1981, 1982: 8-10), and (Van der Leeuw 1977,1984).

According to these models, it can be suggested that the first stage of the development in pottery-making industry at the oldest phase of Late Neolithic, characterised by the lower quality and quantity of the products and sluggish course of development can be assigned to **the household production**.

In household production, a close relationship exists between consumer demand and producer output, and in some cases producer and consumer may be the same individual. In this type of production, demand is usually low or intermediate, and production rate is variable depending on the financial conditions of the individual household production (Rice 1987: 181).

While, the second stage of development between the earlier and later phases of the Late Neolithic period, during which a faster course of development and higher quality and quantity of the products were observed can be assigned to the "**simple household industry"** as suggested by Underhill (1991).

In the simple household industry like household production, a simple pottery-making technology is used by part-time potters and the products are mainly for household consumption but usually higher degree of specialisation and higher quality vessels were produced in greater numbers (Underhill 1991).

On the other hand, considering the facts that no specific areas or workshops were recognised, and the direct evidence of use of complex pottery-making technology such as kilns, moulds, wheels, etc. were not found at Sialk, despite the large quantity and high quality of the Sialk II type pottery recovered from the site, exhibiting quite remarkable resemblance with each other regarding their form, decoration as well as their chemical/ mineralogical compositions, evidencing a certain degree of specialisation in some aspects of pottery-making, as described above, it can be inferred that the mode of production in the Transitional Chalcolithic period at Sialk has been **a complex household industry.**

The Complex household industry is similar to the individual workshop where pottery-making is a major source of income, but contrary to the individual workshop industry where production is carried out in workshops, in 'complex household industry' the houses are used as production centres. In the aforementioned production model, the production rate is also lower in comparison with the individual workshop industry (Underhill 1991).

Although, in household industry, like household production, usually a simple technology is practised by part-time potters, the production which is directed towards a larger consumer market becomes more regularised and is generally conducted more frequently, often on a seasonal basis (Arnold 1991, 92). The household industry can be considered as the beginning of commodisation in which pottery acquires exchange value in addition to use value and is made for someone outside the immediate environment (Rice 1987: 184).

According to Tosi (1984: 49), craft specialisation is a powerful means that by creating various forms of labour and relative incomes or dependence of rural population on centre plays a crucial role in initiation of economic inequality (ibid.). It is also known that the patterns of craft activities within segmentary societies will usually be organised on a form of self-sufficient mode of household production, while the more complex societies generally are arranged on a more centralised mode (Rice 1987; Costin 1991; Wason 2004). According to Childe (1950, 1951) the evolution of complex societies required technological progress and the production of food surplus hence, historically craft specialisation occurred when human society had mastered subsistence techniques and could produce surplus which was necessary to support government bureaucrats, social elites, craft specialists, and other non-food producers that characterise complex societies.

A number of different theoretical approaches have been suggested by archaeologists to study the relationship between craft specialisation and cultural complexity (see Section 7.4.4) in order to explain the transformation from a simple egalitarian society of Neolithic period to the more complex hierarchical society of Transitional Chalcolithic period.

A number of fundamental changes concerning the organisation of production, vertical differentiation, ranking in settlements, unequal access of materials and socio-economic differentiation occur during the Transitional Chalcolithic period.

Changes in material conditions during the Transitional Chalcolithic has also a remarkable effect on the organisation of production and exchange and brings about certain advantages for some groups or individuals at the expense of others. This is the first step in the emergence of the social differentiation in Transitional Chalcolithic societies consequently leading to the ritual-political centralisation in which the elite hold a higher social positions than the commoners who lived in the village.

According to Adams (1979) contrary to the assumption of some researchers, it seems that the ceramic change necessarily did not correlate directly with socio-political change, but had an important role in the overall system of cultural complexity.

Since, there is a close relationship between the degree of craft specialisation and cultural complexity the Transitional Chalcolithic societies possessing certain degree of craft specialisation are usually more complex societies which exhibit some degree of socio-economic differentiation and a more complex divisions of labour, especially in the field of craft production (Clark & Parry 1990: 297-98).

Hence, on the basis of the above points, and considering the course of specialisation and development of pottery-making industry at Sialk, it can be postulated that in the Transitional Chalcolithic period the fundamental steps of the transformation from a simple egalitarian society toward a more complex hierarchical society, with all of its attributes have been taken at Sialk.

Pardis

As already discussed above (Section 7.4.3) the stratigraphic sequence and chronology of Pardis site reveals the occurrence of a gradual evolution of pottery-making from the buff pottery of the Sialk I type (Late Neolithic) to the red pottery of early transitional chalcolithic period. Nearly all the Sialk I type pottery from Pardis had similar chemical and mineralogical compositions as well as very similar microstructures. Therefore, Pardis underwent little change in the methods and techniques of pottery production, material resources and firing technology over a period of 300-350 years. However, as in the other sites of the region studied here, a change was observed from the Sialk I type buff pottery to the calcium-poor, Sialk II type of red pottery specimens belonging to the Transitional Chalcolithic period. This type of red pottery, which was apparently fired at higher temperatures, exhibited quite dense and vitrified microstructures. It can be speculated that the change from the Sialk I type buff pottery vessels to the well-made dense and strong red pottery of Sialk II type, could only have been achieved by the more careful selection of raw materials and better mastering of the firing techniques, including the control of firing temperature, time and atmosphere. These again indicate the existence of a high degree of specialisation in the pottery-making at Pardis at that time.

Hence, considering the aforementioned discussion, it seems that all the three type of specialisation, namely site specialisation, resource specialisation and some fundamental aspects of specialisation in the production of pottery (Rice 1987, 1991; Stark 1991) had been realised at Pardis in the Transitional Chalcolithic period.

It has also been suggested that, during the Transitional Chalcolithic period (5200-4600 BC), the residential part of the site was separated from the workshop area and that the whole workshop area of 400 square metres was continually used for ceramic manufacture. Certainly, all the excavated layers contained kiln remains and other artefacts related to ceramic manufacturing (Fazeli et al. 2007a). This confirms the presence of a permanent ceramic production site from the end of sixth to the first half of fifth millennium BC. Some direct evidences for the mass production and specialisation of ceramic production are also found at Pardis, such as the use of multi-chambered kilns and the fast potters' wheel (Fazeli et al. 2009). In addition to ceramic vessels, a large number of other artefacts such as spindle whorls, slingshots and beads were also recovered from Pardis indicating the existence of considerable speciality in using the main available resources of the site, namely clays, to produce a variety of artefacts (Manuel et al. 2014). Most interestingly, Tepe Pardis also exhibits a quite diversified range of different pottery forming techniques, in fact, it seems that the combination of different techniques such as SSC, coil-building and fast wheel throwing might have coexisted for a long period. Some ceramic scrapers and/or polishers were also unearthed in Transitional Chalcolithic layers (ibid.).

Moreover, regarding the forms of produced vessels it seems that the potters of Pardis in Period II abandoned or changed the quantity of certain type of vessels and produced new vessels trying to fulfil the changing needs of their communities in the fields of cooking, carrying, and storage of food or other applications that were related to the socio-economic change of their societies and their life style.

The direct evidence found in Pardis in the form of a triangular cross-section channel (1 metre in width and 0.24 metres in depth), also implies the existence of artificial water management on Pardis since Late Neolithic, possibly the earliest example of artificial water management in Iran. The antiquity of the channel was supported by absolute dating, supplemented by analysis of associated ceramic sherds and correlation with Late Neolithic levels (Gilmore et al. 2009).

The aforementioned evidence ascertains the position of Tepe Pardis as a specialised ceramic producing centre in the Transitional Chalcolithic period.

On the basis of the scientific analysis carried out in this thesis as well as the analysis of previously excavated material (Coningham et al. 2004; Fazeli et al. 2007a, 2005, 2009; Gilmore et al. 2009), it is possible to determine the mode of ceramic production in the Transitional Chalcolithic period at Pardis.

The mode of ceramic production represents a distinct set of social relations between producers and between producers and consumers differing in terms of scale of production, or quantities of labour and resources used, as well as the vessels produced (Rice 1987: 180-6). Therefore they differ in the degree of intensification or increased efficiency of production aiming to increase the output (ibid.: 190).

Hence, it can be suggested that Tepe Pardis was a specialised pottery producing centre with a mode of production that can be evaluated as "individual workshop industry," this suggestion is also in conformity with other researchers (Fazeli et al. 2001; Manuel et al. 2014). The individual workshop industry is a mode of production in which the production is conducted by full-time potters who exercise more advanced and complex pottery-making technology utilising kilns, moulds, wheels, etc. (see the section 7.4.4). Therefore, on the basis of the above points, and considering the course of specialisation and development of pottery-making industry at Pardis, the Transitional Chalcolithic period, can be introduced as the commencement of the transformation from a simple egalitarian society toward a more complex hierarchical society in this site. In the case of sustainability of this development process many classes of material culture may be produced by specialists, including the goods that require complex production facilities, higher levels of knowledge to conduct complicated production processes, and produce items which require high investments of time and effort (Cross 1993: 65).

8.8 Conclusions and suggestions for further research

When this thesis commenced, it focused on a series of research questions which included what caused the general chromatic change of the pottery from the Late Neolithic to the Transitional Chalcolithic periods? Did this change involve a replacement of selected base materials or rather was it a consequence of refinement of the firing technology? What evidence is there for continuity and change in ceramic technology as well as long distance trade, between the Late Neolithic and Transitional Chalcolithic at Central Plateau of Iran. In this, the final conclusion of this thesis, we are now able to address these questions with a series of responses.

8.8.1 The origin of red colour in Sialk II pottery

Two major type of Sialk pottery, Sialk I type buff pottery belonging to the Late Neolithic period and Sialk II type red pottery belonging to the Transitional Chalcolithic period, are regionally distributed across the whole Central Plateau of Iran. As demonstrated in this study, the latter actually comprises two main groups. The first group of Sialk II red pottery are distinguished by the strong red colour of their surface and buff colour of their core, whilst the specimens of the second group are red both in their core and on their surfaces. It was also revealed that the red-surfaced pottery were manufactured using two different methods. Some examples, such as pottery from Sialk were treated with a fine red slip on their exterior and interior surfaces. At other sites, however, such as Pardis, the red colour of pottery surface was initiated by exercising a more precise control on the firing temperature, time and atmosphere.

This thesis has also demonstrated that the second group of red pottery, are red both on the surface and core, were usually made from low-calcium clays whereas, the red–surfaced pottery was produced from different, calcium–rich clay sources. The calcium-rich, red-surface pottery also shows similar chemical and mineralogical compositions with the Sialk I buff pottery, hence exhibit similar microstructural and mechanical properties with this pottery, whereas the second calcium-poor group of red pottery have fundamental differences with the Sialk I pottery being much stronger, well vitrified and dense and exhibiting much better mechanical and chemical properties. The production of the latter pottery indicates the existence of a high degree of specialisation in the selection of materials and mastering of the firing techniques at this time. As a result, the transition from Sialk I's fragile, buff pottery to Sialk II's strong and dense pottery may be evaluated as a breakthrough in the process of evolution of the pottery-making in the region and indicates the advent of the Transitional Chalcolithic era.

8.8.2 The course of evolution in the pottery-making

A continuous, gradual development in pottery-making was observed at all the prehistoric sites studied herein, especially at Sialk and Pardis sites from the late Neolithic to the Transitional Chalcolithic periods. This course of the development of pottery industry that at first was sluggish in the earlier Sialk I period through the end of this period, gained a great momentum in the Transitional Chalcolithic period as witnessed by the production of the high quality Sialk II type red pottery, (R-R pottery, red both on surface and core), which were denser, less porous, stronger, less fragile and less permeable to liquids.This change was the result of a continuous and gradual development in the level of knowledge and experience in the production of pottery, especially in connection to the selection of materials and mastering of firing techniques, amongst potters of Sialk and Pardis, reaching the high level of maturity enabling them to produce such high quality vessels in the Transitional Chalcolithic period. The huge quantity of the later pottery recovered from the both site, and the resemblance of the products regarding their form, decoration as well as their chemical/ mineralogical compositions and microstructures all indicated the existence of a high degree of specialisation and standardisation among the aforementioned potters in the Transitional Chalcolithic period.

Hence, considering the aforementioned discussion it seems that all the three type of specialisation (Rice 1987, 1991; Stark 1991), namely site specialisation, resource specialisation and some fundamental aspects of specialisation in the production of pottery had been realised at Sialk and Pardis in the Transitional Chalcolithic period.

Considering the facts that no specific areas or workshops were recognised, and the direct evidence of use of complex pottery-making technology such as kilns, moulds, wheels, etc. were not found at Sialk, despite the existence of the aforementioned high degree of specialisation and standardisation among the potters of Sialk in the Transitional Chalcolithic period, it can be inferred that the mode of production in the Transitional Chalcolithic period at Sialk was a **complex household industry.** The Complex household industry is similar to the individual workshop where pottery-making is a major source of income, but contrary to the individual workshop industry where production is carried out in workshops, in 'complex household industry' the houses are used as production centres. (Underhill 1991).

Although, in household industry, like household production, usually a simple technology is practised by part-time potters, the production which is directed towards a larger consumer market becomes more regularised and is generally conducted more frequently, often on a seasonal basis (Arnold 1991: 92). The household industry can be considered as the beginning of commodisation in which pottery acquires exchange value in addition to use value and is made for someone outside the immediate environment (Rice 1987: 184). Hence, on the basis of the above points, and considering the course of specialisation and development of pottery-making industry at Sialk it can be postulated that in the Transitional Chalcolithic period the fundamental steps of the transformation from a simple egalitarian society toward a more complex hierarchical society, with all of its attributes have been taken at Sialk.

On the other hand, some excavations carried out at Pardis discovered the remains of some buildings exhibiting the separation of the residential part of the site from the workshops area that was constantly used for making vessels during the Transitional Chalcolithic period. Moreover, some kiln remains and other artefacts related to ceramic manufacturing were also discovered at this site, including a fast potters’ wheels (Fazeli et al. 2007a; 2010) Gilmore et al. 2009; Manuel et al. 2014).

In addition to ceramic vessels manufactured at Pardis, a large number of other artefacts such as spindle whorls, slingshots and beads were also recovered from the site indicating the existence of considerable speciality in using the main available resources of the site, namely clays, to produce a variety of artefacts (Manuel et al. 2014). Tepe Pardis also exhibits a quite diversified range of different pottery forming techniques, in fact, it seems that the combination of different techniques such as SSC, coil-building and fast wheel throwing might have coexisted for a long period. (ibid.).

The aforementioned evidences ascertained the position of Tepe Pardis as a specialised ceramic producing centre in the Transitional Chalcolithic period.

On the basis of the scientific analysis carried out in this thesis as well as the analysis of previously excavated material (Coningham et al.2004; Fazeli et al. 2007a, 2005, 2009; Gilmore et al. 2009), the mode of ceramic production in the Transitional Chalcolithic period can be suggested as "individual workshop industry," this suggestion is also in conformity with other researchers (Fazeli et al. 2001; Manuel et al. 2014). The individual workshop industry is a mode of production in which the production is conducted by full-time potters who exercise more advanced and complex pottery-making technology utilising kilns, moulds, wheels, etc. (see the Section 7.4.4).

On the basis of the above points, and considering the course of specialisation and development of pottery-making industry at Pardis, the Transitional Chalcolithic period, can be introduced as the commencement of the transformation from a simple egalitarian society toward a more complex hierarchical society in this site.

During this period, a more advanced pottery production system, concerning the scale and rate of production and the degree of specialisation and standardisation, were practised at Pardis. Since, a close relationship exists between the degree of craft specialisation and cultural complexity, and more complex societies have also more complex divisions of labour, especially in the field of craft production, it can be postulated that Padis in the Transitional Chalcolithic period was experiencing a certain degree of socio-economic differentiation and divisions of labour. Craft specialisation is characterised by the transfer of goods from the producers to nondependent consumers, who normally aren't members of the same household, (Clark & Parry 1990: 297-98).

8.8.3 Economic and cultural connections and interactions between prehistoric communities living in the Central Plateau

On the basis of this thesis' results, the following conclusions may be made regarding the economic and cultural connections and interactions of the prehistoric communities living in this region between the Late Neolithic and the Transitional Chalcolithic periods. Firstly, the comparison of pottery from different sites with the same tradition revealed no distinct similarities in chemical composition, hence, resources of raw materials and the details of the technology of pottery-making. Therefore, the possibility of long distance trade, and direct exchange of ceramic articles or production technology, as well as resources between the studied sites in the Late Neolithic and Transitional Chalcolithic periods should be ruled out.

Secondly, based on existing evidence, similarities in the overall evolution pattern of pottery production technology as well as some of the characteristics of pottery such as form and decoration the cultural/technical interactions and exchanges between the prehistoric communities living in this region in the specified time period seems to be extremely likely.

This is consistent with the findings of previous researchers suggesting local, rather than centralised production for the pottery of Central Plateau.

For example, the study of chemical composition of ceramic sherds from six Late Neolithic to Middle Chalcolithic sites on the Tehran Plain, by (ICP-AE), utilising discriminant analysis method, revealed that the ceramics can be partially separated by site according to their chemical composition, indicating the use of similar but discrete local clay resources, in each site (Fazeli, et al. 2001).

Wong, et al. (2010) studied Cheshmeh Ali type wares (Sialk II type pottery) collected from several sites in the Qazvin and Tehran plains by geochemical and petrographic analyses methods. Using discriminant analyses, geochemical groupings have been established that differentiate samples of vessels from the two plains, and also samples from different sites within the Qazvin plain. Thus, even though the samples were petrographically similar, the material from some sites were compositionally distinct, indicating that there were multiple production sites rather than one central production site. The likelihood that there were multiple production locales for Cheshmeh Ali Ware across the north Central Plateau is particularly significant, as the similarity in stylistic and petrographic features is so readily apparent.

According to the aforementioned study, there was localised independent production of ceramics during the Transitional Chalcolithic period, with each site potentially producing for its own needs. Also Fazeli and Djamli (2003) studied eighty samples taken from Zagheh and neighbouring Kamal-Abad sites located in Qazvin plain suggested that the ceramics possibly have been made locally and not imported from a production centre such as Cheshmeh Ali.

Our own study of pottery forms and decorations in this thesis, clearly exhibits the existence of strong cultural connections and interactions between various prehistoric communities living in the Central Plateau in different historical periods. For example, it seems that the Sialk I type pottery forms of Ebrahimabad and Pardis sites have been developed under the strong influence of Sialk, most of their rim forms resemble the Sialk I pottery rims of the Sialk site. However, in the Sialk II period this influence has been replaced or evolved independently into more distinctive cultures, differing from the Sialk II pottery, especially in the Pardis II pottery, interestingly it was found that Ebrahimabad II has been under stronger influence of Pardis II in comparison with the Sialk II.

The phylogenetic analysis of ceramic decorations indicated that the decorations of a Sialk I type pottery group comprising the pottery of the three sites of Sialk, Ebrahimabad and Pardis share a common ancestor and decorations of a Sialk II type pottery group from the same sites are descended from another common ancestor. The first and second triple groups belong to Late Neolithic and the Transitional Calcholitic periods, respectively. Hence, the decorations of Sialk I type pottery recovered from all the three sites are quite similar with each other, but they have no similarity with the decorations of the Sialk II type pottery recovered from the same sites. The latter group of pottery also exhibit close resemblance with each other within the group.The phylogenetic analysis of ceramic forms also suggests that in regard to the pottery forms the Sialk II is directly descended from Sialk I, but Pardis II and Ebrahimabad II are related to the Sialk assemblages, instead of the earlier assemblages from those sites. It suggests that Pardis II and Ebrahimabad II are more influenced by Sialk rather than their own earlier periods. This can be attributed to the much older and far more developed and extended tradition of pottery-making in Sialk in the period of Late Neolithic. In fact, Sialk I pottery exhibited greater numbers of highly diversified type of well-made pottery. Hence, it can be suggested that in the Late Neolithic period, the Sialk I tradition have possibly been spread to Pardis and Ebrahimabad and replaced the local traditions. In the subsequent stages of their development, in the Transitional Chalcolithic period, the pottery-making tradition of Pardis and Ebrahimabad owing to the lack of strong local traditions, had been under the strong influence of Sialk II, interestingly the Ebrahimabad site was been under stronger influence of Pardis II in comparison with the Sialk II. It seems that in the later stages of its development, Pardis grew to exert a more advanced and large community with a developed technology of pottery production enabling it to exert its influence on other regions located in the Central Plateau. These results are in accordance with the results of typological analysis. Wong et al. (2010) in their study on the Cheshmeh Ali pottery samples (Sialk II type pottery), as explained above, showed that there were multiple production sites for Cheshmeh Ali Ware across the north Central Plateau with each site potentially producing for its own needs.

According to the explanation of the authors, when a household-based production operating during the Neolithic period developed into a workshop-based production system during the Transitional Chalcolithic period, in some conditions these workshops didn’t operate as centralised pottery production centres manufacturing material for the surrounding regions. In this case despite the existence of a certain degree of craft specialisation in the given pottery production workshop there is no sign of its integration into a broader regional redistribution economy. The use of similar fabric recipes, pottery forms, as well as decoration designs in various sites or regions indicates that the potters and the consumers of the pots living in a given site perhaps desired to obtain some pottery that was similar to that being produced and used in their neighbouring site and tried to make similar articles.

The authors concluded that their study reveals the existence of the specific types of interaction and communication between the Transitional Chalcolithic populations of the north Central Plateau, exhibiting clear signs of inter-regional, socio-cultural integration, while there is little evidence for the direct and widespread economic interaction, at least in terms of pottery production and distribution (Wong et al. 2010).

The above conclusion is certainly supported by the findings of this thesis concerning the economic and cultural connections and interactions between prehistoric communities living in the Central Plateau, as discussed above. However, further and wider investigation of Tepe Silak may shed further light on the earliest phases of this development.

8.8.4 Limitations of this research and suggestions for further research

The Limitations

The most significant problem encountered during this thesis was the lack of sufficient archaeological investigations and reports published on the prehistory of the Central Plateau of Iran in general and the datasets Collected utilising new techniques of analyses of the excavated pottery in particular. A secondary problem encountered was the existence of very limited information concerning the past palaeoenvironmental and geoarchaeological conditions of Central Plateau of Iran. For example, information on climatic change in terms of variation in temperature, precipitation and other climatic variables, as well as the knowledge on archaeozoology, archaeobotany, soil and sedimentary sequences of the region all must be taken into consideration in the dating and interpretation of material recovered from prehistoric sites.

Suggestions for further research

Considering these limitations and shortcomings there are several ways that could assist better understanding of the prehistory of the Central Plateau and the chronology and cultural-technological development of this region as well as the economic and cultural connections, relations and interactions between prehistoric communities living in the Central Plateau in the Late Neolithic and the Transitional Chalcolithic periods. The following projects are suggested for future research:

- It is suggested to carry out an archaeological research on other sites of the Central Plateau of Iran utilising a more precise chronological dating for archaeological findings, as well as new techniques of analyses of the recovered pottery, which could be an important step in elucidating further information on the development of the prehistoric settlements and their interactions in the Central Plateau during the Neolithic through the Chalcolithic period.
- Since, changes in environment can lead to the cultural responses such as settlement relocation and modification in subsistence strategies, hence, climate, soil, flora, fauna, natural resources and topography of any given region must all be taken into consideration in the dating and interpretation of material recovered from prehistoric sites. Studies in which a combined approach is taken, and the palaeoenvironmental and geoarchaeological information are combined with the archaeological and pottery analyses data seems to be very useful in adding further information on the development of prehistoric communities in the Central Plateau during the proposed period.
- The phylogenetic analysis of ceramic decorations indicated that the decorations of the Sialk I Type pottery comprising the pottery of all the three sites share a common ancestor and the decorations of the Sialk II Type pottery from the same sites have a different common ancestor. This arises an interesting question regarding the identification of the main origin of these decorations, who is the earliest ancestor of these decorations? It seems that exploring the origin of these decorations, which are common between all the prehistoric sites of the Central Plateau, and finding the cause of the existing fundamental difference in decoration between the two types of pottery deserves to carry out an inter-regional study in Central Plateau in this connection. This project in its subsequent stages may

be extended to encompass all the prehistoric sites of Iran, or in a highly ambitious international project it could be further extended to include all the prehistoric pottery decorations of neighbouring countries. This project besides answering the question that has been arisen regarding the origin of pottery decoration, might unveil many undiscovered details concerning the life of the prehistoric communities, the course of their development, and the relations and interactions between them in the whole region.

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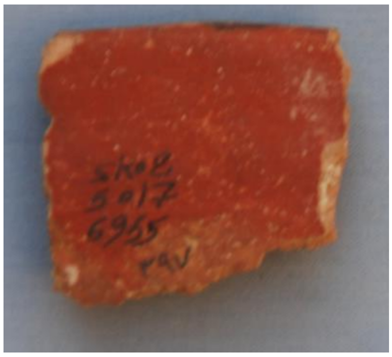
Appendix A

Photographs of pottery sherds

Sialk

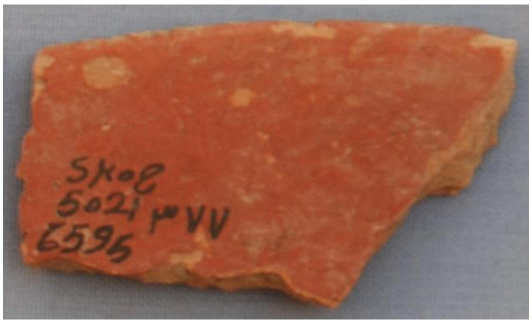
S2p



S2m

S2K


S2i

S2f


S2e


S2d

S2c

S2b

S2a

S1ab


S1ag


S1f


S1l


S1m

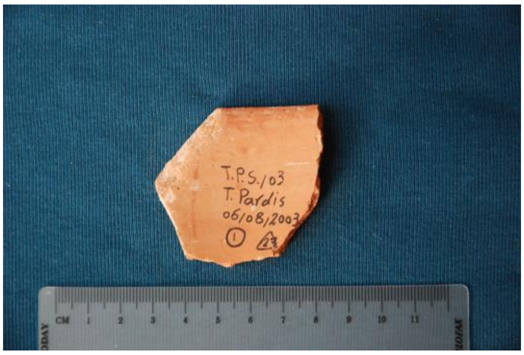
S1n

S1r

S1w

Pardis

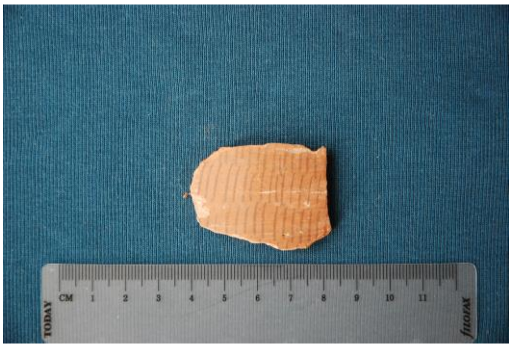
P2h



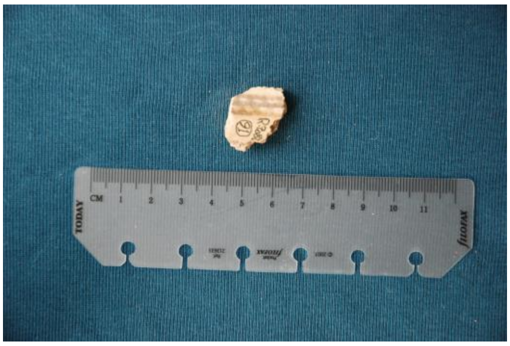
P2g

P2d

P2c




P2b




P1f


P1e


P1d

P1b

P1a

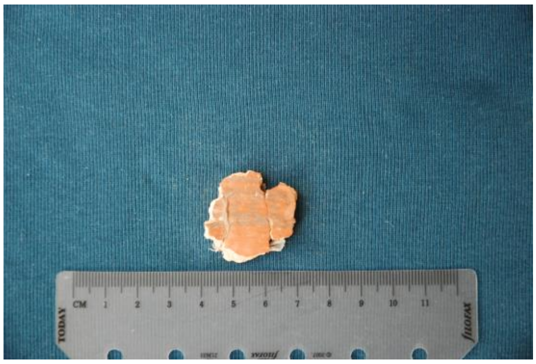
Ebrahimabad

E2i


E2h

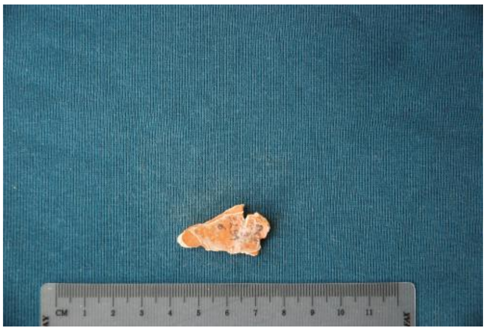

E2g


E2e

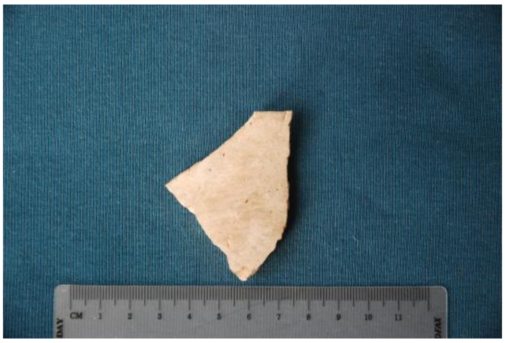



E2d


E2d

E2b




E1T


E1s

E1r

E1p

E1c

Appendix B

Diagnostic pottery Database

Pardis

ID	Context No	Element	Diameter (cm)	Thickness (mm)	Height (cm)	Decoration	Place of Decoration	Colour of Exterior	Colour of Core	Firing
370	2	Rim	32.0	8.0	5.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	2.5 YR6/6 Light Red	Sufficient
371	2	Base	6.0	5.0	3.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 7/6 Reddish Yellow	Sufficient
372	2	Rim	22.0	4.0	3.0	Geometric	Exterior	5YR 7/6 Reddish Yellow	7.5 YR 7/4 Pink	Sufficient
373	2	Carination		4.0	4.0		Exterior	7.5YR 7/4 Pink	5YR 6/4 Light Reddish Brown	Sufficient
374	4	Base	3.0	4.0	3.0		Exterior	5YR 6/8 Reddish Yellow	10YR 6/4 Light Yellowish Brown	Insufficient
375	4	Rim		5.0	7.5	Geometric	Exterior	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
376	4	Rim	32.0	4.0	7.0	Geometric	Exterior	10YR 8/3 Very Pale Brown	7.5YR 5/4 Brown	Sufficient
377	4	Rim	24.0	5.0	4.0		Exterior	5YR 6/6 Reddish Yellow	2.5YR 5/6 Red	Insufficient
378	6	Carination		8.0	10.0	Geometric	Exterior	10YR 7/6 Yellow	7.5YR 7/4 Pink	Sufficient
379	6	Carination		11.0	7.0	Geometric	Exterior	10YR 7/3 Very Pale Brown	10YR 7/3 Very Pale Brown	Sufficient
380	6	Base	7.0	6.0	3.5	None		2.5YR 5/6 Red	10YR 6/4 Light Yellowish Brown	Insufficient
381	6	Rim	18.0	5.0	5.0	Geometric	Exterior	10R 6/6 Light Red	5YR 6/6 Reddish Yellow	Sufficient
382	6	Rim	14.0	4.0	3.0	Geometric	Exterior	10R 6/6 Light Red	5YR 6/4 Light Reddish Brown	Sufficient
383	6	Rim	20.0	3.0	3.0		Exterior	10YR 8/3 Very Pale Brown	10YR 7/3 Very Pale Brown	Sufficient
384	7	Base	11.0	6.0	4.0		Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/6 Light Red	Sufficient

385	7	Rim		7.0	2.0	Geometric	Exterior	2.5YR 6/6 Light Red	10YR 6/4 Light Yellowish Brown	Sufficient
386	7	Rim	16.0	5.0	2.5	Geometric	Exterior	10R 5/6 Red	10R 6/8 Light Red	Insufficient
387	7	Carination		4.0	3.0	Geometric	Exterior	2.5YR 5/6 Red	5YR 6/6 Reddish Yellow	Sufficient
388	7	Carination		7.0	6.5	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
389	11	Rim	14.0	3.0	2.0	Geometric	Exterior	10R 5/6 Red	5YR 6/6 Reddish Yellow	Sufficient
390	11	Rim	23.0	3.0	2.0	Geometric	Interior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
391	11	Rim	22.0	4.0	4.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/6 Light Red	Sufficient
392	11	Carination		9.0	5.5	Geometric and Floral	Exterior	2.5YR 6/6 Light Red	5YR 6/6 Reddish Yellow	Sufficient
393	11	Carination		6.0	4.5	Floral	Exterior	10YR 5/6 Red	2.5YR 6/6 Light Red	Insufficient
394	12	Rim	16.0	3.0	4.0	Geometric	Exterior	2.5YR 5/4 Reddish Brown	7.5YR 6/4 Light Brown	Sufficient
395	12	Carination		5.0	4.5	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 4/1 Dark Reddish Grey	Insufficient
396	12	Base	5.0	6.0	3.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/6 Light Red	Sufficient
397	12	Base	4.0	3.0	2.0	None		7.5YR 5/4 Brown	7.5YR 5/2 Brown	Sufficient
398	13	Carination		5.0	8.0	Geometric	Exterior	10R 5/6 Red	10R 5/6 Red	Sufficient
399	13	Base	5.0	5.0	2.0	Geometric	Exterior	10R 5/6 Red	10R 6/4 Pale Red	Insufficient
400	13	Rim	15.0	2.0	5.0	Geometric	Exterior	10R 6/6 Light Red	10R 5/6 Red	Sufficient
401	13	Rim	15.0	3.0	3.0	Geometric	Exterior	10R 6/8 Light Red	2.5YR 6/6 Light Red	Sufficient
402	13	Rim	11.0	3.0	3.0	Geometric	Exterior	10R 5/6 Red	10R 5/6 Red	Sufficient
403	14	Rim	32.0	6.0	6.0		Interior	5YR 5/4 Reddish Brown	2.5YR 5/4 Reddish Brown	Sufficient
404	14	Carination		5.0	5.5	Geometric	Exterior	2.5YR 5/6 Red	10R 6/6 Light Red	Sufficient
405	17	Rim	28.0	3.0	4.0	Anthropomorphic	Exterior	2.5YR 6/6 Light Red	2.5YR 7/4 Light Reddish Brown	Sufficient
406	17	Rim	22.0	4.0	3.0	Geometric	Exterior	7.5YR 8/4 Pink	7.5YR 8/4 Pink	Sufficient
407	18	Rim	20.0	8.0	8.0	Geometric	Exterior	10R 6/6 Light Red	7.5YR 6/4 Light Red	Insufficient
408	19	Carination		4.0	4.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	7.5YR 8/3 Pink	Sufficient
409	19	Rim	20.0	4.0	3.0	Geometric	Exterior	10R 5/6 Red	5YR 6/6 Reddish Yellow	Sufficient
410	1	Rim	18.0	5.0	5.0	Geometric	Exterior & Interior	2.5YR 6/6 Light Red	2.5YR 6/8 Light Red	Sufficient
411	1	Rim	21.0	4.0	4.0	Geometric	Interior	2.5YR 7/6 Light Red	2.5YR 5/6 Red	Sufficient
412	1	Rim	14.0	6.0	5.0	Geometric	Exterior	10R 5/4 Weak Red	10R 7/4 Pale Red	Sufficient
413	1	Rim	12.0	4.0	4.0	Geometric	Exterior	10R 5/6 Red	10R 6/8 Light Red	Sufficient
414	1	Base	4.0	4.0	1.5	Geometric	Exterior & Interior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
415	1	Rim	20.0	3.0	5.0	Geometric	Exterior	2.5Y 7/3 Pale Yellow	7.5YR 6/4 Light Brown	Sufficient
416	1	Rim	20.0	3.0	5.0	Geometric	Exterior	7.5YR 7/4 Pink	5YR 5/6 Yellowish Red	Sufficient

417	1	Rim		2.0	3.0	Geometric	Exterior	5YR 7/6 Reddish Yellow	5YR 5/6 Yellowish Red	Sufficient
418	1	Rim		3.0	2.0	Geometric	Exterior	10YR 8/2 Very Pale Brown	2.5YR 7/4 Light Reddish Brown	Sufficient
419	1	Base	7.0	9.0	3.5	None		2.5Y 8/3 Pale Brown	5YR 6/6 Reddish Yellow	Sufficient
420	1	Carination		6.0	2.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	2.5YR 6/8 Light Red	Sufficient
421	1	Carination		7.0	4.5	Geometric	Exterior	5Y 8/3 Pale Yellow	10YR 8/2 Very Pale Brown	Sufficient
422	1	Carination		9.0	5.0	Anthropomorphic	Exterior	7.5YR 7/4 Pink	2.5YR 5/6 Red	Sufficient
423	1	Base	5.0	6.0	5.0	Geometric	Exterior & Interior	10YR 5/6 Red	2.5YR 6/8 Light Red	Sufficient
424	1011	Rim	16.0	5.0	3.5	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 5/4 Reddish Brown	Sufficient
425	1011	Rim		10.0	7.0	Geometric	Exterior	10R 5/6 Red	7.5YR 7/4 Pink	Sufficient
426	1011	Carination		6.0	3.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
427	1011	Carination		9.0	4.5	Geometric	Exterior	10YR 5/3 Brown	2.5YR 6/4 Light Reddish Brown	Insufficient
428	1001	Rim	32.0	7.0	3.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 5/8 Red	Sufficient
429	1001	Rim	22.0	7.0	4.0	Geometric	Exterior	2.5YR 5/2 Weak Red	2.5YR 6/4 Light Reddish Brown	Insufficient
430	1001	Rim	10.0	3.0	4.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
431	1001	Rim	16.0	6.0	6.0	Floral	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
432	1001	Base	6.0	4.0	2.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
433	1001	Base	15.0	8.0	4.0	None		2.5YR 5/6 Red	5YR 6/4 Light Reddish Brown	Insufficient
434	1002	Rim	28.0	7.0	7.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 7/3 Pink	Insufficient
435	1002	Rim	12.0	3.0	7.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
436	1002	Rim	12.0	3.0	8.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
437	1002	Rim	18.0	5.0	3.0	Geometric	Exterior & Interior	2.5YR 7/6 Light Red	2.5YR 6/6 Light Red	Sufficient
438	1003	Rim	9.0	4.0	3.0	Anthropomorphic	Exterior	10R 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
439	1003	Rim	15.0	3.0	3.0	Floral	Exterior	10R 6/6 Light Red	2.5YR 6/4 Light Reddish Brown	Sufficient
440	1003	Base	17.0	9.0	4.0	None		10R 6/4 Pale Red	7.5YR 7/4 Pink	Insufficient
441	1003	Carination		4.0	3.0	Geometric	Exterior	2.5Y 6/1 Grey	2.5Y 7/1 Light Grey	Sufficient
442	1003	Carination		5.0	3.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
443	1006	Rim	23.0	5.0	5.0		Exterior & Interior	5YR 7/6 Reddish Yellow	7YR 6/4 Light Reddish Brown	Insufficient
444	1006	Rim	24.0	4.0	2.5		Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
445	1006	Rim	11.0	8.0	4.0		Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Insufficient
446	1006	Rim		11.0	4.0		Exterior	10YR 8/2 Very Pale Brown	10R 6/6 Light Red	Insufficient
447	1006	Rim		6.0	2.5		Exterior	2.5YR 6/4 Light Reddish Brown	10R 7/6 Light Red	Sufficient
448	1006	Base	7.0	9.0	4.0		Exterior	10R 6/6 Light Red	7.5YR 7/3 Pink	Insufficient
449	1006	Base	3.0	2.0	1.0		Exterior	10R 6/6 Light Red	10R 6/1 Reddish Grey	Sufficient
450	1006	Base	5.0	3.0	5.0			2.5YR 8/3 Pale Yellow	2.5YR 8/3 Pale Yellow	Sufficient

451	1007	Rim	13.0	2.0	4.0			10R 7/3 Very Pale Brown	5YR 6/4 Light Reddish Brown	Sufficient
452	1007	Carination		2.0	4.0	Geometric	Exterior	7.5YR 7/4 Pink	5YR 6/4 Light Reddish Brown	Sufficient
453	1007	Carination		2.0	4.0	Geometric	Exterior	10R 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
454	1007	Carination		5.0	6.5	Geometric	Exterior	5YR 6/6 Reddish Yellow	2.5YR 5/6 Red	Insufficient
455	1008	Rim	34.0	14.0	5.0		Exterior & Interior	7.5YR 6/4 Pink	10R 6/6 Light Red	Insufficient
456	1008	Rim		3.0	2.5	Geometric	Exterior	10R 6/6 Light Red	7.5YR 7/4 Pink	Sufficient
457	1009	Rim	15.0	4.0	5.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	10R 7/6 Light Red	Sufficient
458	1009	Rim		2.0	4.0	Geometric	Exterior	7.5YR 6/4 Light Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
459	1010	Rim	27.0	4.0	4.0		Exterior	10R 5/6 Red	10R 6/6 Light Red	Sufficient
460	1010	Rim	13.0	3.0	4.0	Geometric	Exterior	2.5YR 6/6 Light Red	7.5YR 7/4 Pink	Sufficient
461	1010	Rim		5.0	4.5	Geometric & Floral	Exterior	2.5YR 6/6 Light Red	10R 7/6 Light Red	Sufficient
462	1010	Carination		4.0	6.0	Geometric	Exterior	10R 6/6 Light Red	10R 6/4 Pale Red	Insufficient
463	1010	Base	5.0	5.0	3.0	Geometric	Exterior	10R 6/3 Pale Red	10R 7/6 Light Red	Sufficient
464	1010	Base	3.0	3.0	1.0	Geometric	Exterior	2.5YR 6/6 Light Red	10R 7/6 Light Red	Sufficient
465	1012	Rim	16.0	4.0	3.5	None		2.5YR 6/8 Light Red	2.5YR 7/6 Light Red	Sufficient
466	1012	Carination		5.0	6.0	Geometric	Exterior	2.5YR 5/8 Red	5YR 5/4 Reddish Brown	Insufficient
467	1014	Rim		5.0	4.0	Geometric	Exterior	10R 6/6 Light Red	10R 5/6 Red	Sufficient
468	1014	Carination		5.0	5.0	Floral	Exterior	106R 6/4 Pale Red	10R 6/6 Light Red	Sufficient
469	1014	Carination		4.0	5.0	Geometric	Interior	5YR 6/6 Reddish Yellow	5YR 6/6 Reddish Yellow	Sufficient
470	1016	Carination		4.0	5.0	Geometric	Exterior	5YR 7/6 Reddish Yellow	5B 6/1 Bluish Grey	Sufficient
471	1017	Rim	24.0	4.0	4.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
1	3001	Rim	28.0	18.0	8.4	Geometric	Exterior	10R 4/8 Red	10R 6/2 Pale Red	Insufficient
2	3001	Carination		7.0	7.3	Geometric	Exterior	2.5YR 6/6 Light Red	2/5YR 6/4 Light Reddish Brown	Sufficient
3	3001	Base	4.0	5.0	7.0	Geometric	Exterior	10R6/6 Light Red	10R 6/4 Pale red	Sufficient
4	3001	Base	9.0	10.0	4.5	None	-	7.5YR 7/4 Pink	7.5YR 7/4 Pink	Sufficient
5	3001	Rim	16.0	9.0	8.2	Geometric	Exterior	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
6	3001	Rim	30.0	25.0	10.2	None	-	2.5Y 8/4 Pale Yellow	2.5Y 8/4 Pale Yellow	Sufficient
7	3001	Carination		5.0	5.5	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
8	3001	Base	9.0	11.0	6.0	None	-	2.5YR 6/6 Light Red	7.5YR 7/4 Pink	Sufficient
9	3001	Rim	20.0	6.0	3.8	Animal	Interior	10R 4/8 Red	10R 6/4 Pale Red	Sufficient
10	3001	Rim	30.0	16.0	5.5	Incised	Exterior	10R 5/6 Red	10R 6/2 Pale Red	Insufficient
11	3001	Rim	40.0	26.0	9.5	None	-	10YR 6/4 Light Yellowish Brown	10YR Light Grey	Insufficient
12	3001	Rim	10.0	4.0	6.5	Geometric	Exterior	10YR 7/4 Very Pale Brown	10YR 7/3 Very Pale Brown	Sufficient

13	3001	Rim	13.0	6.0	4.8	Geometric	Exterior	7.5 YR 7/6 Reddish Yellow	7.5YR 6/6 Reddish Yellow	Sufficient
14	3001	Carination		8.0	5.0	Geometric	Exterior	2.5YR 6/6 Light Red	10YR 7/3 Very Pale Brown	Sufficient
15	3001	Rim	16.0	4.0	3.2	Geometric	Exterior	7.5YR 6/4 Light Brown	7.5YR 6/4 Light Brown	Sufficient
16	3001	Carination		7.0	3.5	Plant	Exterior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
17	3001	Rim	13.0	4.0	7.2	Geometric	Exterior	10R 6/4 Pale Red	10R 6/4 Pale Red	Sufficient
18	3008	Rim	10.0	5.0	5.5	Geometric	Exterior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
19	3008	Rim	40.0	23.0	14.5	None	-	10R 6/6 Light Red	10R 5/2 Weak Red	Insufficient
20	3008	Rim	30.0	8.0	8.5	Incised	Exterior	5GY 5/1 Greenish Grey	5GY 5/1Greenish Grey	Sufficient
21	3008	Base	24.0	13.0	7.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/4 Light Reddish Brown	Sufficient
22	3008	Carination	30.0	23.0	9.8	Geometric	Exterior	10R 5/8 Red	10R 6/6 Light Red	Insufficient
23	3008	Rim	26.0	7.0	4.5	Geometric	Exterior	5YR 6/4 Light Reddish Brown	5YR 7/4 Pink	Insufficient
24	3008	Rim	16.0	5.0	6.0	Geometric	Exterior	10R 5/8 Red	10R 5/6 Red	Sufficient
25	3008	Rim	23.0	7.0	3.0	Geometric	Exterior	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
26	3008	Base		19.0	6.3	None	-	10R 6/6 Light Red	10R 6/6 Light Red	Insufficient
27	3008	Base	5.0	8.0	4.5	Geometric	Exterior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
28	3008	Rim		5.0	7.5	Plant	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
29	3008	Rim	20.0	5.0	4.0	Geometric	Interior	10R 5/6 Red	10R 7/4 Pale Red	Insufficient
30	3008	Carination		9.0	6.3	Animal	Exterior	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
31	3008	Rim	25.0	10.0	4.5	Plant	Exterior	7.5 YR 7/4 Pink	7.5 YR 7/4 Pink	Sufficient
32	3008	Carination		4.0	5.2	?	Exterior	10R 5/8 Red	10R 6/6 Light Red	Sufficient
33	3008	Rim	13.0	4.0	3.2	Geometric	Exterior	5YR 6/6 Reddish Yellow	10R 6/6 Light Red	Sufficient
34	3008	Carination		7.0	3.2	Geometric	Exterior	7.5YR 6/6 Reddish Yellow	10YR 7/4 Very Pale Brown	Sufficient
35	3008	Carination		11.0	7.8	Plant	Exterior	10YR 7/4 Very Pale Brown	5YR 7/4 Pink	Sufficient
36	3008	Rim	12.0	4.0	4.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	7.5YR 7/4 Pink	Sufficient
37	3008	Carination		11.0	4.8	Animal	Exterior	10R 6/4 Pale Red	10R 6/4 Pale Red	Sufficient
38	3026	Rim	24.0	6.0	5.4	Geometric	Exterior & Interior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
39	3027	Rim	24.0	18.0	11.0	None	-	10R 5/6 Red	10R 6/4 Pale Red	Insufficient
40	3027	Carination		19.0	10.0	Geometric	Exterior	10R 4/8 Red	10R 6/4 Pale Red	Insufficient
41	3027	Rim	12.0	5.0	6.2	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
42	3027	Rim	18.0	4.0	4.5	Animal	Exterior	5YR 6/6 Reddish Yellow	5YR 6/6 Reddish Yellow	Sufficient
43	3027	Rim	20.0	6.0	10.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 6/1 Grey	Insufficient
44	3027	Rim	35.0	9.0	4.0	None	-	5YR 6/1 Grey	5YR 6/1 Grey	Sufficient
45	3027	Base		21.0	6.5	none	-	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
46	3027	Rim	14.0	8.0	3.1	Plant	Exterior	7.5 YR 7/4 Pink	10YR 7/4 Very Pale Brown	Sufficient

47	3027	Carination		6.0	6.0	Geometric	Exterior	10R 5/6 Red	10R 6/6 Light Red	Sufficient
48	3027	Carination		7.0	7.5	Plant	Exterior	5YR 6/4 Light Reddish Brown	5YR 7/3 Pink	Sufficient
49	3027	Carination		7.0	4.5	Plant	Exterior	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
50	3027	Carination		9.0	4.3	None	-	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
51	3028	Rim	20.0	10.0	3.5	Geometric	Interior	10R 5/8 Red	7.5YR 7/4 Pink	Sufficient
52	3028	Carination		6.0	8.0	Plant	Exterior	10R 6/8 Light Red	10R 6/8 Light Red	Sufficient
53	3028	Rim	10.0	5.0	5.5	Geometric	Exterior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
54	3028	Base	5.0	5.0	4.8	Geometric	Exterior & Interior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
55	3036	Carination		12.0	13.6	Geometric	Exterior	7.5YR 6/3 Light Red	7.5YR 6/3 Light Brown	Insufficient
56	3008	Rim		5.0	6.8	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
57	3008	Carination		11.0	10.2	Plant	Exterior	7.5YR 7/4 Pink	7.5YR 7/4 Pink	Sufficient
77	3074	Rim	25.0	8.0	10.0	Geometric	Exterior	2.5YR 5/6 Red	7.5YR 5/1 Grey	Insufficient
104	3001	Carination		2.0	2.0	Animal	Exterior	5YR 5/6 Yellowish Red	5YR 6/3 Pale Brown	Sufficient
69	3001	Rim	17.0	6.5	3.0	Geometric	Exterior	10YR 6/6 Brownish Yellow	10YR 6/3 Pale Brown	Insufficient
68	3070	Rim	21.0	7.0	4.0	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 5/2 Weak Red	Insufficient
71	3070	Rim	12.0	4.0	5.5	Geometric	Exterior	7.5YR 6/3 Light Brown	7.5YR 6/2 Pinkish Yellow	Sufficient
70	3032	Rim	14.0	5.0	5.5	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	5YR 6/6 Reddish Yellow	Sufficient
117	3032	Carination		6.0	3.5	Geometric	Exterior	5YR 5/6 Yellowish Red	10YR 7/3 Very Pale Brown	Sufficient
119	3032	Carination		6.0	5.0	Geometric	Exterior	5YR 6/4 Light Reddish Brown	7.5YR 6/3 Light Brown	Insufficient
65	3027	Rim	36.0	8.0	8.0	Geometric	Exterior	7.5YR 6/6 Reddish Yellow	10YR 7/3 Very Pale Brown	Insufficient
76	3027	Carination	22.0	7.0	6.0	Geometric	Exterior	5YR 5/6 Yellowish Red	7.5YR 6/3 Light Brown	Insufficient
64	3027	Rim	20.0	6.0	11.0	Geometric	Exterior	10YR 6/4 Light Yellowish Brown	10YR 6/4 Light Yellowish Brown	Sufficient
118	3072	Carination		26.0	7.0	Geometric	Exterior	5YR 5/4 Yellowish Red	7.5YR 6/2 Pinkish Grey	Insufficient
67	3027	Rim	10.0	6.0	5.0	Plant	Exterior	5YR 5/6 Yellowish Red	7.5YR 6/2 Pinkish Grey	Insufficient
66	3027	Rim	14.0	5.0	3.0	Plant	Exterior	5YR 5/4 Reddish Brown	7.5YR 6/2 Pinkish Grey	Sufficient
82	3070	Rim	20.0	5.0	3.0	Geometric	Exterior	10YR 5/6 Red	2.5YR 5.4 Reddish Brown	Insufficient
101	3070	Base	6.0	7.0	2.5	Geometric	Exterior	10YR 5/8 Red	5YR 5/4 Reddish Brown	Insufficient
100	3070	Base	7.0	6.0	5.0	Geometric	Exterior	10YR 5/6 Red	5YR 6/4 Light Reddish Brown	Insufficient
81	3070	Rim	22.0	6.0	4.5	Geometric	Exterior	10YR 5/6 Red	10YR 6/1 Grey	Insufficient
78	3053	Rim	11.0	4.0	6.5	Geometric	Exterior	2.5YR 5/8 Red	5YR 6/3 Light Reddish Brown	Insufficient

116	3053	Carination	11.0	4.0	6.5	Geometric	Exterior	2.5YR 5/8 Red	5YR 6/3 Light Reddish Brown	Insufficient
74	3053	Rim	15.0	5.0	6.5	Geometric	Exterior	10 YR5/6 Red	5YR 6/4 Light Reddish Brown	Sufficient
75	3053	Rim	16.0	4.0	3.5	Geometric	Exterior	10YR 5/6 Red	2.5YR 6/6 Light Red	Sufficient
103	3053	Carination		5.0	4.5	Geometric	Exterior	10YR 4/6 Red	7.5YR 5/2 Brown	Insufficient
72	3053	Rim	17.0	3.0	3.5	Geometric	Exterior	10YR 5/6 Red	7.5YR 7/1 Light Grey	Sufficient
79	3053	Rim	16.0	5.0	3.5	Geometric	Exterior	2.5YR 5/6 Red	7.5YR 6/2 Pinkish Grey	Insufficient
73	3053	Rim	17.0	4.0	5.0	Geometric	Exterior	10YR 5/6 Red	7.5YR 6/6 Light Brown	Sufficient
105	3053	Carination		6.0	5.5	Geometric	Exterior	2.5YR 5/8 Red	5YR 5/6 Yellowish Red	Sufficient
106	3008	Carination		6.0	3.5	Plant	Exterior	2.5YR 5/6 Red	7.5YR 6/4 Light Brown	Sufficient
85	3015	Rim	13.0	5.0	3.5	Geometric	Exterior	10YR 4/8 Red	5YR 5/6 Yellowish Red	Insufficient
111	3079	Carination		8.0	8.0	Geometric	Exterior	5YR 6/4 Light Reddish Brown	5YR 6/4 Light Reddish Brown	Insufficient
86	3079	Rim	17.0	4.0	4.5	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 6/4 Light Reddish Brown	Sufficient
61	3079	Rim	14.0	4.0	3.5	Geometric	Exterior	5YR 5/6 Yellowish Red	5YR 6/4 Light Reddish Brown	Sufficient
108	3079	Carination		9.0	7.5	Animal	Exterior	10YR 5/6 Red	7.5YR 6/3 Light Brown	Insufficient
109	3079	Carination		7.0	7.0	Geometric	Exterior	7.5YR 5/4 Brown	7.5YR 5/2 Brown	Insufficient
107	3032	Carination		5.0	3.0	Animal	Exterior	5YR 5/6 Yellowish Red	7.5YR 6/3 Light Brown	Insufficient
80	3070	Rim	22.0	10.0	7.0	Geometric	Exterior	10YR 7/3 Very Pale Brown	10YR 6/3 Pale Brown	Insufficient
63	3070	Rim	14.0	5.0	7.0	Geometric	Exterior & Interior	2.5YR 5/6 Red	2.5YR 5/4 Reddish Brown	Insufficient
115	3070	Carination		4.0	4.0	Geometric	Exterior	5YR 5/4 Reddish Brown	7.5YR 6/3 Light Brown	Insufficient
93	3070	Rim	24.0	7.0	9.0	Geometric	Exterior	2.5YR 5/8 Red	5YR 5/4 Reddish Brown	Insufficient
62	3070	Rim	14.0	4.0	3.0	Geometric	Exterior & Interior	10YR 8/4 Very Pale Brown	5YR 5/8 Yellowish Red	Sufficient
59	3053	Complete	24.0	24.0	14.0	Geometric	Exterior	2.5YR 4/6 Red	2.5YR 4/6 Red	Insufficient
60	3015	Complete	24.0	12.5	28.0	Geometric	Exterior	10YR 6/6 Light Red	10YR 6/6 Light Red	Sufficient
58	3053	Complete	26.0	28.0	13.0	Geometric	Exterior	10YR 5/6 Red	10YR 5/6 Red	Insufficient
97	3008	Base	5.0	4.0	2.0	Geometric	Exterior	5YR 6/6 Reddish Yellow	10YR 6/6 Light Red	Sufficient
89	3008	Rim	15.0	7.0	6.5	Geometric	Interior	10YR 6/6 Reddish Yellow	2.5YR 5/6 Red	Sufficient
112	3008	Rim	11.0	4.0	4.0	Geometric	Exterior	5YR 5/6 Yellowish Red	5YR 6/1 Grey	Sufficient
90	3008	Rim	17.0	4.0	4.5	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 5/6 Yellowish Red	Sufficient
91	3008	Rim	18.0	8.0	5.5	Geometric	Exterior	2.5YR 4/6 Red	10YR 4/1 Dark Reddish Grey	Insufficient
102	3028	Carination		4.0	4.5	Geometric	Exterior	10YR 5/6 Red	2.5YR 7/1 Light Reddish Grey	Insufficient
114	3028	Carination		4.0	4.5	Geometric	Exterior	10YR 5/6 Red	2.5YR 7/1 Light Reddish Grey	Insufficient
83	3028	Rim	35.0	7.0	20.0	Geometric	Exterior	10YR 5/6 Red	5YR 7/1 Light Grey	Sufficient
84	3028	Rim	12.0	2.0	3.5	Geometric	Exterior	5YR 6/6 Reddish Yellow	10YR 7/1 Light Grey	Sufficient
110	3079	Carination		7.0	7.0	Geometric	Exterior	5YR 5/8 Yellowish Red	5YR 5/4 Reddish Brown	Sufficient

92	3079	Rim	37.0	7.0	14.5	Geometric	Exterior & Interior	5YR 5/6 Yellowish Red	5YR 6/1 Grey	Insufficient
87	3079	Rim	60.0	12.0	14.0	Geometric	Exterior	2.5YR 5/6 Red	5YR 6/1 Grey	Insufficient
113	3079	Carination		6.0	10.5	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 6/4 Light Reddish Brown	Insufficient
96	3079	Base	6.0	5.0	4.0	Geometric	Exterior	2.5YR 4/6 Red	2.5YR 6/6 Light Red	Sufficient
95	3053	Rim	24.0	8.0	10.0	Geometric	Exterior	2.5YR 4/6 Red	5YR 6/3 Light Reddish Brown	Insufficient
88	3079	Rim	23.0	9.0	5.5	Geometric	Exterior	2.5YR 5/6 Red	5YR 6/2 Pinkish Grey	Insufficient
99	3053	Base	11.0	10.0	5.0	None	-	2.5YR 6/4 Reddish Brown	5YR 6/4 Light Reddish Brown	Insufficient
98	3053	Base	10.0	4.0	9.0	None	-	2.5YR 5/4 Reddish Brown	5YR 6/1 Grey	Insufficient
94	3079	Rim	27.0	10.0	41.0	Geometric	Exterior	2.5YR 5/6 Red	10YR 3/1 Very Dark Grey	Insufficient
139	4003	Rim	2.2	4.0	6.2	Geometric	Exterior	5YR 6/8 Reddish Yellow	5YR 7/6 Reddish Yellow	Sufficient
242	4011	Carination		10.0	11.9	Geometric	Exterior	10R 6/4 Pale Red	10R 6/6 Light Red	Sufficient
130	4001	Rim	20.0	11.0	5.4	Geometric	Exterior	10R 6/6 Light Red	10R 6/8 Light Red	Sufficient
176	4011	Rim	20.0	3.0	6.3	Geometric	Exterior	10R 5/6 Red	10R 7/4 Pale Red	Sufficient
132	4001	Rim	27.0	8.0	4.5	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 7/6 Light Red	Insufficient
162	4006	Rim	26.0	8.0	3.5	None	Exterior	5Y 8/2 Pale Yellow	5/6 ? Grey	Sufficient
175	4011	Rim	23.0	4.0	4.8	Geometric	Exterior	10R 5/4 Weak Red	10R 6/6 Light Red	Sufficient
161	4006	Rim	30.0	8.0	6.9	Geometric	Exterior	10R 6/8 Light Red	10R 6/3 Pale Red	Sufficient
237	4011	Carination		5.0	4.7	Geometric	Exterior	5Yr 5/4 Reddish Brown	2.5YR 5/8 Red	Sufficient
238	4011	Carination		4.0	2.3	Geometric	Exterior	2.5YR 5/8 Red	10YR 6/4 Light Yellowish Brown	Sufficient
183	4011	Base	7.0	3.0	4.7	Geometric	Exterior	10Y 5/8 Red	10Y 5/8 Red	Sufficient
181	4011	Rim	21.0	4.0	5.8	Geometric	Exterior	10R 5/8 Red	10R 7/6 Light Red	Sufficient
177	4011	Rim	22.0	4.0	5.4	Geometric	Exterior	10R 6/4 Pale Red	10R 7/4 Pale Red	Sufficient
151	4003	Base	8.0	10.0	4.3	Geometric	Exterior	2.5YR 5/8 Red	2.5YR 5/8 Red	Sufficient
184	4011	Rim	14.0	3.0	2.9	Geometric	Exterior	10R 5/6 Red	10R 6/4 Pale Red	Sufficient
211	4015	Base	4.2	4.0	2.5	None	-	2.5YR 5/6 Red	2.5YR 6/6 Light Red	Sufficient
257	4011	Rim	30.0	7.0	5.6	Geometric	Interior	7.5YR 6/6 Reddish Yellow	5YR 6/6 Reddish Yellow	Sufficient
241	4024	Carination		5.0	5.5	Geometric	Exterior	10R 5/6 Red	10R 7/3 Pale Red	Sufficient
239	4011	Carination		7.0	6.3	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/4 Light Yellowish Brown	Sufficient
244	4024	Carination		7.0	4.2	Geometric	Exterior	5YR 6/6 Reddish Yellow	2.5YR 6/6 Light Red	Sufficient
231	4003	Carination		5.0	6.3	Geometric	Exterior	7.5YR 7/4 Pink	7.5YR 8/2 Pinkish White	Sufficient
133	4001	Rim	21.0	5.0	3.1	Geometric	ext & int	10YR 5/8 Red	2.5YR 6/8 Light Red	Sufficient
200	4027	Rim	15.0	3.0	2.7	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/2 Pale Red	Sufficient
149	4003	Rim	24.0	5.0	5.7	Geometric	Exterior	10R 6/6 Light Red	10R 7/4 Pale Red	Sufficient
138	4003	Rim	20.0	10.0	5.7	None	-	2.5YRYR 7/6 Light Red	5YR 7/8 Reddish Yellow	Sufficient

153	**4003**	**Complete**	**7.0**	**4.0**	**8.2**	**Geometric**	**Exterior**	**5YR 6/8 Reddish Yellow**	**5YR 6/8 Reddish Yellow**	**Sufficient**
142	**4003**	**Base**	**8.0**	**9.0**	**6.8**	**None**	**-**	**10R 5/6 Red**	**10R 7/4 Pale Red**	**Sufficient**
144	**4003**	**Rim**	**19.0**	**4.0**	**4.5**	**Geometric**	**Exterior**	**2.5YR 6/6 Light Red**	**2.5YR 6/8 Light Red**	**Sufficient**
122	**4001**	**Rim**	**28.0**	**6.0**	**5.1**	**Geometric**	**Exterior**	**10R 6/4 Pale Red**	**2.5YR 5/1 Reddish Grey**	**Insufficient**
128	**4001**	**Rim**	**10.0**	**9.0**	**3.8**	**None**	**-**	**10Y 5/6 Red**	**5YR 6/4 Reddish Brown**	**Insufficient**
229	**4001**	**Carination**		**7.0**	**4.6**	**Geometric**	**Exterior**	**7.5YR 6/6 Reddish Yellow**	**7.5YR 7/3 Pink**	**Sufficient**
141	**4003**	**Rim**	**20.0**	**13.0**	**8.8**	**None**	**-**	**10R 5/6 Red**	**10R 6/1 Reddish Grey**	**Insufficient**
121	**4001**	**Rim**	**28.0**	**4.0**	**3.9**	**Geometric**	**Exterior**	**10R 6/4 Pale Red**	**10R 7/4 Pale Red**	**Sufficient**
190	**4024**	**Rim**	**22.0**	**1.0**	**5.2**	**Geometric**	**Interior**	**10R 5/6 Red**	**10R 6/2 Pale Red**	**Sufficient**
173	**4001**	**Rim**	**47.0**	**17.0**	**10.4**	**Geometric**	**Interior**	**5YR 5/6 Yellowish Red**	**5YR 5/2 Reddish Grey**	**Insufficient**
233	**4004**	**Carination**		**7.0**	**8.0**	**Geometric**	**Exterior**	**10R 5/6 Red**	**10R 6/4 Pale Red**	**Sufficient**
234	**4004**	**Carination**		**9.0**	**8.8**	**Geometric**	**Exterior**	**10R 5/6 Red**	**10R 5/1 Reddish Grey**	**Insufficient**
198	**4024**	**Rim**	**23.0**	**5.0**	**4.4**	**Geometric**	**Exterior**	**2.5YR 6/6 Light Red**	**2.5YR 6/4 Light Reddish Brown**	**Sufficient**
157	**4004**	**Rim**	**28.0**	**14.0**	**8.6**	**None**	**-**	**2.5YR 7/4 Pale Yellow**	**5YR 7/4 Pink**	**Insufficient**
199	**4024**	**Rim**	**23.0**	**12.0**	**10.9**	**None**	**-**	**2.5YR 6/6 Light Red**	**2.5YR 7/3 Light Reddish Brown**	**Sufficient**
146	**4003**	**Rim**	**19.0**	**7.0**	**5.0**	**Incised**	**Exterior**	**2.5Y 7/4 Pale Yellow**	**2.5YR 7/4 Pale Yellow**	**Sufficient**
155	**4004**	**Rim**	**12.0**	**10.0**	**6.0**	**None**	**-**	**10R 6/6 Light Red**	**10R5/1 Reddish Grey**	**Sufficient**
235	**4004**	**Carination**		**8.0**	**6.5**	**Geometric**	**Exterior**	**2.5YR 6/6 Light Red**	**2.5YR 7/3 Light Reddish Brown**	**Sufficient**
154	**4004**	**Rim**	**23.0**	**4.0**	**5.3**	**Geometric**	**Exterior**	**2.5YR 6/4 Light Reddish Brown**	**2.5YR 7/3 Light Reddish Brown**	**Sufficient**
126	**4001**	**Rim**	**27.0**	**6.0**	**6.6**	**Geometric**	**Exterior**	**10YR 7/8 Yellow**	**10YR 7/6 Yellow**	**Sufficient**
124	**4001**	**Rim**	**20.0**	**3.0**	**10.6**	**Geometric**	**Exterior**	**10R 5/6 Red**	**10R 6/6 Light Red**	**Sufficient**
160	**4004**	**Rim**	**12.0**	**8.0**	**7.4**	**None**	**-**	**2.5YR 8/2 Pale Yellow**	**10YR 8/4 Very Pale Brown**	**Sufficient**
230	**4001**	**Carination**		**12.0**	**12.4**	**Geometric**	**Exterior**	**2.5YR 8/2 Pale Yellow**	**2.5YR 7/4 Light Reddish Brown**	**Sufficient**
228	**4001**	**Carination**		**11.0**	**7.4**	**Geometric**	**Exterior**	**7.5YR 8/2 Pinkish White**	**5YR 7/4 Pink**	**Sufficient**
159	**4005**	**Rim**	**23.0**	**8.0**	**3.5**	**Geometric**	**Exterior**	**10R 6/6 Light Red**	**7.5YR 7/3 Pink**	**Sufficient**
129	**4001**	**Rim**	**6.0**	**4.0**	**3.1**	**Geometric**	**Exterior**	**10YR 7/6 Yellow**	**7.5YR 6/6 Reddish Yellow**	**Insufficient**
245	**4024**	**Carination**		**6.0**	**5.6**	**Geometric**	**Exterior**	**10R 6/6 Light Red**	**10R 7/4 Pale Red**	**Sufficient**
203	**4031**	**Rim**	**21.0**	**14.0**	**4.7**	**None**	**-**	**10R 5/8 Red**	**10R 6/3 Pale Red**	**Sufficient**
226	**4001**	**Carination**		**8.0**	**11.0**	**Geometric**	**Exterior**	**10R 6/6 Light Red**	**10R 5/1 Reddish Grey**	**Insufficient**
140	**4003**	**Rim**	**28.0**	**5.0**	**10.3**	**Geometric**	**Exterior**	**10R 5/8 Red**	**10R 6/6 Light Red**	**Sufficient**
136	**4001**	**Rim**	**31.0**	**5.0**	**3.2**	**Geometric**	**Interior**	**2.5YR 6/6 Light Red**	**2.5YR 6/6 Light Red**	**Sufficient**
135	**4001**	**Rim**	**30.0**	**5.0**	**7.3**	**Geometric**	**Exterior**	**10R 5/6 Red**	**10R 6/8 Light Red**	**Sufficient**
123	**4001**	**Rim**	**23.0**	**6.0**	**7.3**	**Geometric**	**Exterior**	**10R 5/6 Red**	**10R 6/4 Pale Red**	**Sufficient**
145	**4003**	**Rim**	**21.0**	**4.0**	**5.8**	**Geometric**	**Exterior**	**7.5YR 6/6 Reddish Yellow**	**5YR 6/8 Reddish Yellow**	**Sufficient**
254	**4004**	**Base**	**15.0**	**11.0**	**6.2**	**None**	**-**	**2.5Y 8/3 Pale Yellow**	**5Y 7/2 Light Grey**	**Sufficient**

202	4031	Rim	25.0	14.0	8.4	None	-	10R 5/6 Red	7.5YR 6/2 Pinkish Grey	Sufficient
191	4024	Rim	23.0	5.0	4.8	Geometric	Exterior	10Y 5/8 Red	5YR 7/8 Reddish Yellow	Sufficient
127	4001	Rim	12.0	4.1	4.3	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 5/8 Red	Insufficient
227	4001	Carination		8.0	7.1	Geometric	Exterior	7.5YR 7/3 Pink	7.5YR 8/2 Pinkish White	Sufficient
197	4024	Rim	20.0	5.0	4.6	Geometric	Interior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
252	4034	Rim		6.0	9.4	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/8 Light Red	Sufficient
152	4003	Rim	30.0	12.0	10.5	None	-	2.5YR 6/6 Light Red	2.5YR 6/2 Pale Red	Insufficient
143	4003	Rim	15.0	4.0	5.8	Geometric	Exterior	2.5YR 5/8 Red	2.5YR 5/8 Red	Sufficient
247	4024	Carination		5.0	3.8	Geometric	Exterior	2.5YR 5/8 Red	10Y 5/8 Red	Sufficient
156	4004	Rim	22.0	6.0	4.9	Geometric	Exterior	5YR 5/8 Yellowish Red	2.5YR 6/8 Light Red	Sufficient
120	4001	Rim	23.0	24.0	4.7	Geometric	Exterior	10R 6/6 Light Red	2.5YR 5/1 Reddish Grey	Insufficient
164	4007	Rim	29.0	5.0	7.1	Geometric	Interior	2.5 YR 5/6 Red	10R 6/2 Pale Red	Insufficient
253	4034	Rim		4.0	9.7	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
222	4079	Rim	25.0	6.0	4.9	Geometric	Exterior	5YR 5/4 Reddish Brown	5YR 6/6 Reddish Yellow	Sufficient
220	4078	Rim	23.0	6.0	8.6	Geometric	Exterior & Interior	10R 5/6 Red	2.5YR 6/6 Light Red	Sufficient
219	4078	Rim	18.0	4.0	4.7	Geometric	Exterior	10R 5/6 Red	2.5YR 7/4 Light Reddish Brown	Sufficient
215	4067	Base	9.0	10.0	4.8	Geometric	Exterior	10R 5/6 Red	2.5YR 6/6 Light Red	Sufficient
216	4067	Base	9.0	10.0	4.8	Geometric	Exterior	10R 5/6 Red	2.5YR 6/6 Light Red	Sufficient
251	4076	Carination		6.0	4.7	Geometric	Exterior	5YR 6/6 Reddish Yellow	5YR 7/3 Pink	Sufficient
131	4001	Rim	21.0	10.0	5.6	None	-	10R 5/6 Red	5YR 6/4 Light Reddish Brown	Sufficient
262	4024	Base	4.0	3.0	2.0	Geometric	Exterior	10R 5/4 Weak Red	2.5YR 7/2 Pale Red	Sufficient
150	4003	Base	6.0	6.0	3.3	None	-	5YR 6/6 Reddish Yellow	5YR 7/4 Pink	Sufficient
243	4024	Carination		5.0	4.0	Geometric	Exterior	7.5YR 5/6 Strong Brown	10Y 6/4 Light Yellowish Brown	Sufficient
259	4012	Rim	30.0	9.0	4.1	Geometric	Exterior	10YR 6/6 Brown Yellow	10YR 7/4 Very Pale Brown	Sufficient
182	4011	Rim	24.0	5.0	5.4	Geometric	Exterior	10R 5/8 Red	10R 7/4 Pale Red	Sufficient
201	4027	Rim	16.0	7.0	3.6	Geometric	Exterior	2.5YR 6/8 Light Red	2.5YR 5/8 Red	Sufficient
178	4011	Rim	19.0	4.0	2.9	Geometric	Exterior	7.5YR 7/6 Reddish Yellow	5YR 7/6 Reddish Yellow	Sufficient
163	4006	Rim	25.0	8.0	4.8	Plant	Exterior	5YR 6/8 Reddish Yellow	2.5YR 6/8 Red	Insufficient
240	4011	Carination		9.0	10.6	Geometric	Exterior	10R 6/6 Light Red	10R 7/4 Light Red	Insufficient
232	4001	Carination		12.0	12.4	Geometric	Exterior	2.5YR 8/2 Pale Yellow	2.5YR 7/4 Light Reddish Brown	Sufficient
208	4044	Rim	13.0	7.0	4.7	Geometric	Exterior	2.5YR 5/6 Red	2.5YR7/4 Light Reddish Brown	Sufficient
213	4044	Base	9.0	10.0	4.2	None	-	2.5YR 6/6 Light Red	10R 7/4 Pale Red	Sufficient

214	4044	Base	6.0	4.0	1.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	10R 6/2 Pale Red	Sufficient
221	4078	Rim	19.0	5.0	3.5	Geometric	Exterior	2.5YR 4/6 Red	2.5YR 6/6 Light Red	Sufficient
218	4077	Rim	17.0	4.0	4.0	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 6/4 Light Reddish Brown	Sufficient
207	4044	Rim	18.0	4.0	6.7	Geometric	Exterior	2.5YR 5/6 Red	2.5YR7/6 Light Red	Sufficient
170	4007	Rim	29.0	10.0	5.0	None	-	2.5YR 8/3 Pale Yellow	7.5YR 7/3 Pink	Sufficient
166	4007	Rim	20.0	8.0	1.9	None	-	2.5YR 7/1 Light Grey	5Y 7/1 Light Grey	Sufficient
255	4007	Rim	12.0	10.0	2.7	None	-	5Y 8/3 Pale Yellow	10YR 7/2 Light Grey	Sufficient
169	4007	Rim	50.0	21.0	43.0	None	-	5Y 8/2 Pale Yellow	5YR 7/4 Pink	Sufficient
167	4007	Rim	36.0	12.0	4.3	None	-	5Y 5/2 Olive Grey	5Y 4/2 Olive Grey	Sufficient
168	4007	Rim	34.0	20.0	5.2	None	-	10YR 8/3 Very Pale Brown	7.5YR 7/4 Pink	Sufficient
165	4007	Rim	20.0	9.0	4.2	None	-	5Y 8/3 Pale Yellow	2.5YR 8/3 Pale Yellow	Sufficient
217	4068	Rim	19.0	4.0	8.1	Geometric	Exterior	10R 6/6 Light Red	10R 7/4 Pale Red	Sufficient
206	4044	Rim	21.0	6.0	5.0	Geometric	Exterior	2.5YR 5/6 Red	10R 7/6 Light Red	Sufficient
194	4026	Rim	20.0	4.0	6.9	Geometric	Exterior & Interior	10R 6/6 Light Red	10R 7/4 Pale Red	Sufficient
248	4026	Carination		5.0	5.0	Geometric	Interior	10R 6/6 Light Red	2.5YR 6/8 Light Red	Sufficient
195	4026	Rim	28.0	11.0	7.7	Geometric	Exterior	10R 6/4 pale Red	10R 7/3 Pale Red	Sufficient
205	4041	Rim	22.0	3.0	7.0	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 5/4 Reddish Brown	Sufficient
196	4026	Rim	42.0	10.0	8.7	Geometric	Exterior	10R 6/6 Light Red	10R 7/3 Pale Red	Sufficient
189	4019	Rim	16.0	4.0	4.3	None	-	5YR 6/4 Light Reddish Brown	2.5YR 6/6 Light Red	Sufficient
188	4019	Rim	19.0	5.0	3.1	Geometric	Exterior	2.5YR 5/4 Reddish Brown	2.5YR 6/3 Light Reddish Brown	Sufficient
185	4011	Rim	18.0	5.0	3.8	Geometric	Exterior & Interior	5YR 5/4 Reddish Brown	7.5YR 7/6 Reddish Yellow	Sufficient
210	4053	Rim	16.0	4.0	7.7	Geometric	Exterior	10R 6/6 Light Red	10R 6/6 Light Red	Sufficient
250	4055	Handle / Rim	8.0	5.0	1.3	None	-	5YR 7/6 Reddish Yellow	5YR 7/6 Reddish Yellow	Sufficient
249	4044	Carination		11.0	9.6	Geometric	Exterior	10R 6/6 Light Red	10R 7/6 Light Red	Insufficient
212	4044	Base	7.0	4.0	3.7	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	7.5YR 6/6 Reddish Yellow	Sufficient
187	4019	Rim	25.0	4.0	6.0	Geometric	Exterior	2.5YR 5/6 Red	5YR 6/8 Reddish Yellow	Sufficient
186	4019	Rim	35.0	12.0	4.5	Geometric	Exterior	10R 6/6 Light Red	7.5YR 8/4 Pink	Sufficient
236	4007	Carination		22.0	10.3	None	-	10YR 5/3 Brown	10YR 7/3 Very Pale Brown	Sufficient
246	4007	Handle		10.0	5.0	None	-	2.5YR 8/2 Pale Yellow	5YR 7/4 Pink	Sufficient
179	4011	Rim	9.0	7.0	3.4	Geometric	Exterior	2.5YR 5/8 Red	2.5YR 5/8 Red	Sufficient
260	4012	Rim	19.0	8.0	4.8	Geometric	Exterior & Interior	2.5YR 6/8 Light Red	5YR 6/6 Reddish Yellow	Sufficient
204	4035	Rim	19.0	4.0	5.9	Geometric	Exterior	10R 6/6 Light Red	10R 7/4 Pale Red	Sufficient
171	4001	Rim	44.0	14.0	10.6	Geometric	Exterior	5YR 6/4 Light Reddish Brown	5YR 6/3 Light Reddish Brown	Sufficient

172	4001	Carination		1.0	13.8	Geometric	Interior	2.5YR 5/6 Red	2.5YR 7/4 Light Reddish Brown	Sufficient
174	4001	Rim	33.0	8.0	10.4	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/4 Light Reddish Brown	Sufficient
125	4001	Rim	18.0	14.0	4.4	None	-	2.6YR 6/6 Light Red	2.5YR 8/4 Pink	Insufficient
158	4004	Rim	40.0	15.0	5.6	None	-	2.5YR 5/6 Red	7.5YR 7/6 Reddish Yellow	Sufficient
137	4003	Rim	30.0	12.0	8.7	Geometric	Exterior	10R 6/6 Light Red	10R 7/6 Light Red	Sufficient
256	4008	Rim	25.0	3.0	4.3	Geometric	Exterior & Interior	10R 5/8 Red	10R 6/6 Light Red	Sufficient
147	4003	Rim	27.0	7.0	3.4	Geometric	Exterior	2.5Y 8/6 Yellow	7.5YR 6/8 Reddish Yellow	Insufficient
148	4003	Rim	29.0	4.0	4.2	Geometric	Exterior	10R 7/4 Pale Red	10R 6/6 Light Red	Sufficient
258	4011	Rim	24.0	4.0	3.4	Geometric	Exterior	5YR 6/8 Reddish Yellow	5YR 6/6 Reddish Yellow	Sufficient
193	4026	Rim	29.0	8.0	4.1	Geometric	Interior	2.5YR 5/8 Red	7.5YR 6/6 Reddish Yellow	Insufficient
225	4015	Rim	45.0	8.0		Geometric Animal	Exterior	2.5YR 4/6 Red	2.5YR 6/6 Light Red	Insufficient
261	4015	Base	7.0	7.0	4.3	Geometric	Exterior	2.5YR 5/3 Reddish Brown	2.5YR 4/8 Red	Sufficient
180	4011	Rim	22.0	5.0	8.3	Geometric	Exterior	2.5YR 5/4 Reddish Brown	2.5YR 6/8 Light Red	Sufficient
223	4079	Base	6.0	7.0	3.6	None	-	2.5YR 8/3 Pale Yellow	2.5YR 6/8 Light Red	Sufficient
224	4079	Rim	20.0	4.0	4.1	Geometric	Exterior	2.5YR 6/6 Light Red	5YR 6/6 Reddish Yellow	Sufficient
192	4024	Rim	28.0	5.0	6.3	Geometric	Exterior	10R 6/6 Light Red	10R 5/8 Red	Sufficient
263	4060	Rim	20.0	4.0	4.5	Geometric	Exterior	5YR 5/4 Reddish Brown	7.5YR 7/4 Pink	Insufficient
264	4060	Rim	40.0	12.0	4.0	Geometric	Exterior & Interior	2.5YR 4/4 Reddish Brown	10YR 5/3 Brown	Insufficient
265	4098	Rim	19.0	7.0	6.0	Geometric	Exterior & Interior	7.5YR 6/4 Light Brown	5YR 6/4 Light Reddish Brown	Insufficient
266	4001	Rim	18.0	5.0	3.5	None	-	5YR 6/4 Light Reddish Brown	5YR 6/4 Light Reddish Brown	Sufficient
267	4060	Rim	11.0	4.0	4.5	Geometric	Exterior	7.5YR 5/3 Brown	7.5YR 6/3 Light Brown	Sufficient
268	4088	Rim	21.0	4.0	5.0	Geometric	Exterior	2.5YR 5/6 Red	7.5YR 6/4 Light Brown	Insufficient
269	4019	Rim	22.0	7.0	3.0	Geometric	Exterior	2.5YR 4/8 Red	7.5YR 5/4 Brown	Insufficient
270	4019	Rim	29.0	5.0	5.0	Geometric	Exterior & Interior	10YR 5/6 Red	2.5YR 5/4 Reddish Brown	Insufficient
271	4100	Rim	29.0	5.0	7.5	Geometric	Interior	7.5YR 6/4 Light Brown	5YR 6/4 Light Reddish Brown	Sufficient
272	4060	Rim	15.0	3.0	9.0	Geometric	Exterior	10YR 5/6 Red	2.5YR 7/2 Pale Red	Insufficient
273	4060	Base	4.5	4.0	2.0	Geometric	Exterior	2.5YR 5/6 Red	7/5YR 6/2 Pinkish Grey	Insufficient
274	4060	Base	6.0	4.0	2.0	None	Exterior	7/5YR 5/4 Brown	7.5YR 6/3 Light Brown	Insufficient
275	4098	Base	11.0	7.0	1.5	Geometric	Interior	2.5YR 5/6 Red	2.5YR 6/6 Light Red	Insufficient
276	4001	Base	8.0	73.0	2.5	None	-	10YR 5/6 Yellowish Red	10YR 4/2 Dark Greyish Brown	Insufficient

277	**4100**	**Base**	**10.0**	**8.0**	**3.0**	**None**	**-**	**10YR 5/6 Yellowish Red**	**5YR 6/3 Light Reddish Brown**	**Insufficient**
278	**4098**	**Carination/Handle**		**17.0**	**5.0**	**None**	**-**	**7.5YR 5/3 Brown**	**5YR 6/1 Grey**	**Insufficient**
279	**4088**	**Carination**		**7.0**	**7.5**	**Geometric**	**Exterior**	**2.5YR 5/4 Red**	**2.5YR 5/6 Red**	**Insufficient**
280	**4088**	**Carination**		**5.0**	**2.5**	**Geometric**	**Exterior**	**2.5YR 6/6 Light Red**	**5YR 6/6 Reddish Yellow**	**Sufficient**
281	**4088**	**Carination**		**15.0**	**5.5**	**Geometric**	**Interior**	**10YR 4/8 Red**	**7.5YR 4/1 Dark Grey**	**Insufficient**
282	**4091**	**Carination**		**6.0**	**6.5**	**Animal**	**Exterior**	**2.5YR 5/6 Red**	**2.5YR 5/4 Reddish Brown**	**Insufficient**
283	**4097**	**Carination**		**16.0**	**7.5**	**Geometric**	**Exterior**	**7.5YR 6/6 Reddish Yellow**	**5YR 8/1 White**	**Insufficient**
284	**4098**	**Carination**		**7.0**	**6.5**	**Plant**	**Exterior**	**2.5YR 5/8 Red**	**5YR 5/6 Yellowish Red**	**Insufficient**
285	**4004**	**Carination**		**6.0**	**4.5**	**Geometric**	**Exterior**	**2.5YR 5/6 Red**	**7.5YR 7/2 Pinkish Grey**	**Sufficient**
286	**4060**	**Complete Vessel**	**22.0**	**8.1**	**15.0**	**Geometric**	**Exterior**	**10YR 4/8 Red**	**10YR 4/8 Red**	**Sufficient**
287	**4060**	**Complete Vessel**	**24.0**	**12.0**	**14.0**	**None**	**-**	**2.5YR 4/6 Red**	**2.5YR 4/6 Red**	**Insufficient**
291	**5002**	**Rim**	**24.0**	**6.0**	**9.6**	**Geometric**	**Exterior**	**10R 5/8 Red**	**10R 6/8 Light Red**	**Sufficient**
296	**5003**	**Rim**	**21.0**	**5.0**	**7.0**	**Geometric**	**Exterior & Interior**	**5YR 5/6 Yellowish Red**	**2.5YR 6/8 Light Red**	**Insufficient**
292	**5002**	**Rim**	**22.0**	**5.0**	**5.7**	**Geometric & Animal**	**Exterior**	**2.5YR 5/8 Red**	**2.5YR 6/8 Light Red**	**Sufficient**
289	**5001**	**Rim**	**13.0**	**5.0**	**5.9**	**Geometric**	**Exterior**	**5YR 6/6 Reddish Yellow**	**2.5YR 5/1 Reddish Grey**	**Sufficient**
294	**5003**	**Rim**	**45.0**	**9.0**	**13.9**	**Geometric**	**Interior**	**2.5YR 5/8 Red**	**10R 6/8 Light Red**	**Sufficient**
293	**5002**	**Rim**		**9.0**	**6.2**	**Geometric**	**Exterior**	**10R 6/6 Light Red**	**10R 5/8 Red**	**Insufficient**
290	**5001**	**Base**	**9.0**	**9.0**	**5.5**	**None**	**-**	**2.5YR 6/8 Light Red**	**10R 6/8 Light Red**	**Sufficient**
295	**5003**	**Base**	**3.5**	**6.0**	**3.0**	**Geometric**	**Exterior**	**2.5YR 5/8 Red**	**2.5YR 6/8 Light Red**	**Sufficient**
288	**5001**	**Carination**		**8.0**	**7.1**	**Geometric & Plant**	**Exterior**	**2.5YR 7/1 Light Reddish Grey**	**2.5YR 6/8 Light Red**	**Insufficient**
297	**7021**	**Rim**	**34.0**	**3.0**	**2.2**	**Geometric**	**Exterior & Interior**	**7.5YR 7/3 Pink**	**2.5YR 6/3 Light Reddish Brown**	**Sufficient**
298	**7018**	**Rim**		**8.0**	**3.3**	**Geometric**	**Interior**	**10YR 8/3 Very Pale Yellow**	**5YR 6/4 Light Reddish Brown**	**Sufficient**
299	**7017**	**Rim**	**20.0**	**5.0**	**5.1**	**Geometric**	**Exterior & Interior**	**2.5YR 8/3 Pale Yellow**	**5YR 7/6 Reddish yellow**	**Sufficient**
300	**7017**	**Rim**	**26.0**	**5.0**	**5.8**	**Geometric**	**Exterior & Interior**	**2.5YR 8/4 Pale Yellow**	**7.5YR 8/4 Pink**	**Sufficient**
301	**7018**	**Rim**	**53.0**	**17.0**	**7.0**	**Geometric**	**Exterior**	**10R 6/4 Pale Red**	**10R 6/6 Light Red**	**Sufficient**
302	**7017**	**Rim**	**43.0**	**6.0**	**8.5**	**Geometric**	**Exterior**	**2.5YR 6/6 Light Red**	**2.5YR 6/6 Light Red**	**Sufficient**
303	**7015**	**Rim**	**21.0**	**4.0**	**4.4**	**Geometric**	**Interior**	**2.5YR 6/6 Light Red**	**2.5YR 6/4 Light Reddish Brown**	**Sufficient**
304	**7007**	**Rim**	**39.0**	**14.0**	**8.8**	**None**	**-**	**10YR 8/3 Very Pale Brown**	**10YR 7/4 Very Pale Brown**	**Sufficient**
305	**7013**	**Rim**	**24.0**	**5.0**	**3.5**	**Geometric**	**Exterior**	**2.5YR 6/4 Light Reddish Brown**	**10R 6/4 Pale Red**	**Sufficient**
306	**7013**	**Rim**	**30.0**	**4.0**	**5.0**	**Geometric**	**Exterior**	**10R 6/6 Light Red**	**10R 6/4 Pale Red**	**Sufficient**
307	**7004**	**Rim**	**54.0**	**11.0**	**21.5**	**Geometric**	**Exterior**	**7.5YR 7/4 Pink**	**7.5YR 6/1 Grey**	**Insufficient**

308	7006	Rim	33.0	7.0	8.8	Geometric	Exterior	5YR 6/4 Light Reddish Brown	10R 6/6 Light Red	Sufficient
309	7018	Rim	38.0	12.0	7.6	Geometric	Exterior	2.5YR 6/3 Light Reddish Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
310	7007	Rim	28.0	15.0	8.0	None	-	7.5YR 8/4 Pink	10YR 7/4 Very Pale Brown	Sufficient
311	7005	Rim	11.0	4.0	2.9	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 7/3 Light Reddish Brown	Sufficient
312	7005	Rim	14.0	4.0	4.4	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	10R 6/6 Light Red	Sufficient
313	7005	Rim	28.0	7.0	4.4	Geometric	Exterior	10R 4/6 Red	10R 5/1 Reddish Grey	Insufficient
314	7005	Rim	21.0	6.0	10.5	Geometric	Exterior	2.5YR 5/6 Red	5YR 7/3 Pink	Sufficient
315	7022	Rim	35.0	10.0	3.9	None	-	10YR 8/2 Very Pale Brown	7.5YR 7/2 Pinkish Grey	Sufficient
316	7018	Rim	28.0	4.0	2.7	None	-	10YR 3/1 Very Dark Grey	10YR 3/1 Very Dark Grey	Insufficient
317	7014	Rim	13.0	4.0	2.9	Geometric	Exterior	2.5YR 5/4 Reddish Brown	2.5YR 6/6 Light Red	Sufficient
318	7018	Rim		5.0	4.0	Geometric	Exterior	7.5YR 7/3 Pink	5YR 6/6 Reddish Yellow	Sufficient
319	7018	Rim	46.0	4.0	3.5	Geometric	Exterior & Interior	5YR 7/2 Pinkish Grey	5YR 5/1 Grey	Insufficient
320	7018	Rim		4.0	3.2	Geometric	Exterior	10R 5/6 Red	2.5YR 6/4 Light Reddish Brown	Sufficient
321	7020	Rim		4.0	3.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/3 Light Reddish Brown	Sufficient
322	7017	Rim		7.0	2.2	Geometric	Exterior	5YR 8/1 White	2.5YR 6/6 Light Red	Sufficient
323	7017	Rim		5.0	3.0	Geometric	Exterior	5YR 6/3 Light Reddish Brown	5YR 6/4 Light Reddish Brown	Sufficient
324	7017	Rim		5.0	4.4	Animal	Exterior	2.5YR 6/6 Light Red	2.5YR 4/1 Dark Reddish Grey	Insufficient
325	7023	Rim		9.0	4.5	None	-	7.5YR 7/3 Pink	7.5YR 5/1 Grey	Insufficient
326	7022	Rim		9.0	3.8	Geometric	Exterior & Interior	2.5Y 8/2 Pale Yellow	2.5Y 7/2 Light Grey	Sufficient
327	7023	Carination		9.0	2.9	Geometric	Exterior & Interior	2.5Y 8/2 Pale Yellow	10YR 6/2 Light Brownish Grey	Insufficient
328	7022	Carination		8.0	2.9	Geometric	Exterior & Interior	2.5Y 8/2 Pale Yellow	2.5Y 7/2 Light Grey	Sufficient
329	7021	Carination		6.0	7.5	Geometric	Exterior & Interior	7.5YR 7/3 Pink	2.5YR 6/3 Light Reddish Brown	Insufficient
330	7021	Carination		4.0	1.5	Geometric	Exterior & Interior	7.5YR 7/3 Pink	7.5YR 6/1 Grey	Insufficient
331	7018	Carination		5.0	2.1	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
332	7021	Carination		4.0	1.6	Geometric	Exterior & Interior	2.5Y 8/2 Pale Yellow	2.5YR 6/3 Light Reddish Brown	Insufficient
333	7022	Carination		8.0	3.5	Geometric	Exterior & Interior	2.5Y 8/2 Pale Yellow	5YR 7/6 Reddish Yellow	Sufficient
334	7022	Carination		11.0	5.3	Geometric	Interior	2.5Y 8/2 Pale Yellow	2.5Y 7/2 Light Grey	Sufficient

335	7023	Rim		5.0	2.0	Geometric	Exterior & Interior	5YR 8/2 Pinkish White	5YR 6/2 Pinkish Grey	Insufficient
336	7023	Carination		7.0	2.6	Geometric	Exterior & Interior	10YR 7/2 Light Grey	7.5YR 7/4 Pink	Sufficient
337	7023	Carination		8.0	2.8	Geometric	Exterior & Interior	10YR 8/2 Very Pale Brown	10YR 6/2 Light Brownish Grey	Insufficient
338	7023	Carination		10.0	2.6	Geometric	Exterior	10YR 8/2 Very Pale Brown	10YR 8/2 Very Pale Brown	Insufficient
339	7023	Carination		8.0	8.2	Geometric	Exterior	2.5Y 8/2 Pale Yellow	2.5Y 8/2 Pale Yellow	Sufficient
340	7023	Carination		8.0	2.9	Geometric	Exterior & Interior	10YR 8/2 Very Pale Brown	5YR 6/2 Pinkish Grey	Insufficient
341	7023	Carination		9.0	2.5	Geometric	Exterior & Interior	2.5Y 7/1 Light Grey	7.5YR 6/3 Light Brown	Insufficient
342	7018	Carination		9.0	2.5	Geometric	Exterior & Interior	5YR 7/2 Pinkish Grey	5YR 5/1 Grey	Insufficient
343	7018	Carination		4.0	3.7	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 7/6 Light Red	Sufficient
345	7021	Carination		6.0	2.3	Geometric	Exterior & Interior	7.5YR 7/3 Pink	7.5YR 7/4 Pink	Insufficient
344	7018	Carination		4.0	4.3	Geometric	Exterior	2.5Y 8/2 Pale Yellow	7.5YR 7/3 Pink	Insufficient
346	7020	Carination		3.0	3.9	Geometric	Exterior	7.5YR 7/4 Pink	7.5YR 6/3 Light Brown	Insufficient
347	7018	Carination		4.0	3.1	Geometric	Exterior	2.5YR 5/6 Red	5YR 6/6 Reddish Yellow	Sufficient
348	7018	Carination		13.0	7.9	Geometric	Exterior	2.5Y 8/2 Pale Yellow	2.5YR 5/2 Weak Red	Insufficient
349	7018	Carination		5.0	7.7	Geometric	Interior	2.5Y 8/2 Pale Yellow	2.5Y 4/1 Dark Grey	Insufficient
350	7014	Carination	34.0	4.0	4.0	Geometric	Exterior	10R 6/4 Pale Red	2.5YR 6/6 Light Red	Sufficient
351	7021	Carination		4.0	2.3	Geometric	Exterior & Interior	7.5YR 8/2 Pinkish white	2.5YR 6/3 Light Reddish Brown	Sufficient
352	7014	Carination		4.0	3.1	Geometric	Exterior	10YR 7/3 Very Pale Brown	7.5YR 7/4 Pink	Sufficient
353	7009	Carination		5.0	4.2	Geometric	Exterior	7.5YR 5/4 Brown	2.5YR 6/4 Light Reddish Brown	Sufficient
354	7021	Carination		6.0	3.3	Geometric	Exterior	7.5YR 7/3 Pink	5YR 5/1 Grey	Insufficient
355	7013	Carination		6.0	4.8	Geometric	Exterior	10YR 7/4 Very Pale Brown	7.5YR 7/4 Pink	Sufficient
357	7018	Carination		4.0	5.3	Geometric	Exterior & Interior	5YR 8/1 White	5YR 5/1 Grey	Insufficient
358	7021	Base	8.0	5.0	1.8	Geometric	Exterior	2.5YR 6/6 Light Red	5YR 5/4 Pink	Sufficient
359	7006	Base	8.0	8.0	3.4	Geometric	Interior	10R 5/6 Red	2.5YR 6/4 Light Reddish brown	Sufficient
360	7013	Base	5.0	5.0	2.0	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	2.5YR 6/4 Light Reddish brown	Sufficient
361	7005	Base	5.0	6.0	1.8	Geometric	Exterior	2.5YR 6/4 Light Reddish Brown	10R 6/6 Light Red	Sufficient
362	7015	Base	3.0	6.0	2.7	Geometric	Exterior	2.5YR 5/2 Weak Red	2.5YR 5/2 Weak Red	Insufficient
363	7013	Base	5.0	3.0	2.0	Geometric	Exterior	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Sufficient
364	7018	Base	5.0	8.0	4.0	None	-	7.5YR 6/2 Pinkish Grey	7.5YR 3/1 Very Dark Grey	Insufficient

365	7018	Base	5.0	6.0	2.7	None	-	10YR 8/2 Very Pale Yellow	2.5YR 5/3 Reddish Brown	Insufficient
366	7018	Base	6.0	10.0	4.4	Geometric	Interior	5YR 6/3 Light Reddish Brown	5YR 3/1 Very Light Grey	Insufficient
367	7004	Base	10.0	15.0	12.3	None	-	7.5YR 7/4 Pink	7.5YR 6/1 Grey	Insufficient
368	7007	Base	25.0	14.0	6.2	None	-	10YR 7/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Sufficient
369	7007	Base	16.0	18.0	10.0	None	-	10YR 7/4 Very Pale Brown	10YR 5/2 Greyish Brown	Insufficient

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ID	Context No	Element	Diameter (cm)	Thickness (mm)	Height (cm)	Decoration	Place of Decoration	Colour of Exterior	Colour of Core	Firing
370	115	Rim	20	6	7	Geometric	Exterior	5 YR 7/4 pink	2.5 YR 6/6 light red	Sufficient
371	8	Base	19	10	6	Geometric	Exterior	2.5 Y 8/2 pale yellow	2.5 Y 8/2 pale yellow	Sufficient
372	119	Rim	8	6	3.2	Geometric	Exterior	7.5 YR 5/6 strong brown	2.5 YR 5/6 red	Sufficient
373	1	Carination	21	5	3.6		Exterior	2.5 YR 5/6 red	2.5 YR 3/3 dark reddish brown	Sufficient
374	8	Base	24	6	4		Exterior	2.5 YR 6/6 light red	2.5 YR 6/6 light red	Insufficient
375	132	Rim	10	11	5.5	Geometric	Exterior	7.5 YR 7/4 pink	7.5 YR 7/4 pink	Sufficient
376	132	Rim	13	10	4	Geometric	Exterior	10 YR 7/2 light gray	10 YR 6/2 light brownish gray	Sufficient
377	162	Rim	3	17	9		Exterior	2.5 Y 7/2 light gray	2.5 Y 7/2 light gray	Insufficient
378	136	Carination	30	6.5	2.8	Geometric	Exterior	10 YR 8/2 very pale brown	10 YR 7/3 very pale brown	Sufficient
379	115	Carination	19.5	8	7	Geometric	Exterior	10 YR 7/3 very pale brown	10 YR 7/4 very pale brown	Sufficient
380	115	Base	`9	4	5.7	None		10 R 5/6 red	10 R 5/6 red	Insufficient
381	115	Rim	10	8	4.5	Geometric	Exterior	7.5 YR 7/3 pink	2.5 YR 7/3 light reddish brown	Sufficient
382	128	Rim	19	6	4.5	Geometric	Exterior	10 YR 7/6 reddish yellow	10 YR 6/6 brownish yellow	Sufficient
383	115	Rim	11	10	9		Exterior	7.5 YR 7/4 pink	7.5 YR 7/4 pink	Sufficient
384	115	Base	27.5	8	4.5		Exterior	10 R 5/6 red	10 R 5/6 red	Sufficient

385	128	Rim	15	9	5	Geometric	Exterior	7.5 YR 6/3 light brown	10 YR 8/1 white	Sufficient
386	119	Rim	17	6	2.2	Geometric	Exterior	11 YR 8/3 very pale brown	10 YR 7/3 very pale brown	Insufficient
387	118	Carination	30	6	3.2	Geometric	Exterior	5 YR 7/4 pink	5 YR 7/4 pink	Sufficient
388	section	Carination	25	5	4	Geometric	Exterior	5YR 6/6 reddish yellow	10 YR 7/3 very pale brown	Sufficient
389	119	Rim	20	6	4	Geometric	Exterior	2.5 Y 7/3 pale yellow	2.5 Y 7/3 pale yellow	Sufficient
390	119	Rim	21	7	4	Geometric	Interior	10 YR 7/3	10 YR 7/3 very pale brown	Sufficient
391	119	Rim	13	6	4	Geometric	Exterior	2.5 Y 7/3 pale yellow	2.5 Y 7/3 pale yellow	Sufficient
392	119	Carination	10	7	4	Geometric and Floral	Exterior	10 YR 7/3	10 YR 7/3 very pale brown	Sufficient
393	201	Carination	12	4	4.7	Floral	Exterior	2.5YR 4/6 Red	2.5YR 4/6 Red	Insufficient
394	201	Rim	14	5	11.5	Geometric	Exterior	10R 6/8 Light red	10R 6/8 Light red	Sufficient
395	202	Carination	18	6	7	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 5/6 Red	Insufficient
396	203	Base	18	2	4	Geometric	Exterior	2.5YR 5/6 Red	2.5YR 3/3 Dark reddish brown	Sufficient
397	203	Base	13	3	02-May	None		2.5YR 5/4 Reddish brown	2.5YR 5/4 Reddish brown	Sufficient
398	202	Carination	18	7	4.5	Geometric	Exterior	10YR 8/3 Very pale brown	7.5Y 7/4 Pink	Sufficient
399	204	Base	19	6	2.5	Geometric	Exterior	5YR 6/6 reddish yellow	10YR 7/3 very pale brown	Insufficient
400	204	Rim	9	5	4.5	Geometric	Exterior	10YR 7/2 Light gray	10YR 6/2 Light brownish gray	Sufficient
401	205	Rim	17	7	4.5	Geometric	Exterior	10 YR 8/2 very pale brown	10YR 7/3 very pale brown	Sufficient
402	209	Rim	10	6	6	Geometric	Exterior	10YR 7/4 Very pale brown	10YR 7/3 Very pale brown	Sufficient
403	207	Rim	11	3	3		Interior	2.5YR 6/6 light red	2.5YR 6/6 light red	Sufficient
404	207	Carination	12	2	3	Geometric	Exterior	10R 5/6 red	10R 5/6 red	Sufficient
405	208	Rim	22	5	4.8	Anthropomorphic	Exterior	10YR 7/2 Light gray	10YR 6/2 Light brownish gray	Sufficient
406	238	Rim	26	10	4.3	Geometric	Exterior	2.5Y 8.3 pale yellow	10YR 8.4 very pale brown	Sufficient
407	276	Rim	19	8	7.3	Geometric	Exterior	2.5YR 7.2 light gray	2.Y 7.3 pale yellow	Insufficient
408	257	Carination	20	8	4.8	Geometric	Exterior	10YR 6.3 pale yellow	10YR 6.3 pale yellow	Sufficient
409	255	Rim	16	6.5	5.2	Geometric	Exterior	2.5YR 6.6 light red	2.5YR 6.8 light red	Sufficient
410	266	Rim	10	5	2.5	Geometric	Exterior & Interior	7.5YR 8.3 pink	7.5YR 7.3 pink	Sufficient
411	260	Rim	9	6	5.2	Geometric	Interior	7.5Yr 7.4 pink	5Yr 6.4 light reddish brown	Sufficient
412	257	Rim	8	6.5	4.7	Geometric	Exterior	5Yr 7.2 pinkish gray	5Yr 7.3 pink	Sufficient
413	301	Rim	17	4	2.5	Geometric	Exterior	7.5YR 5.4 brown	7.5YR 6.4 brown	Sufficient
414	301	Base	11	5	4	Geometric	Exterior & Interior	10YR 7.3 verry pale brown	10YR 6.3 pale brown	Sufficient
415	301	Rim	8	7	4	Geometric	Exterior	10YR 7.3 verry pale brown	10YR 4.2 dark grayish brown	Sufficient

416	305	Rim	17	4	2.5	Geometric	Exterior	2.5YR 6.2 light brownish gray	2.5YR 6.2 light brownish gray	Sufficient
417	305	Rim	24	8	2.1	Geometric	Exterior	2.5YR 6.2 light brownish gray	2.5YR 6.2 light brownish gray	Sufficient
418	305	Rim	24	8	4	Geometric	Exterior	10YR 7.3 very pale brown	10YR 7.4 very pale brown	Sufficient
419	305	Base	21	8	2.3	None		7.5YR 7.3 pink	7.5YR 7.3 pink	Sufficient
420	306	Carination	19	1	4	Geometric	Exterior	7.5YR 6.4 pink	10YR 7.4 verry pale brown	Sufficient
421	306	Carination	24	12	7.2	Geometric	Exterior	7.5YR 7.4 PINK	7.5YR7.4 PINK	Sufficient
422	306	Carination	22	3	3	Anthropomorphic	Exterior	10YR 7.4 verry pale brown	2.5YR 6.6 light red	Sufficient
423	306	Base	17	3	4.3	Geometric	Exterior & Interior	7.5YR 5.4 brown	7.5YR 5.4 brown	Sufficient
424	308	Rim	16	5	8	Geometric	Exterior	7.5YR 7.4 pink	7.5YR 7.4 pink	Sufficient
425	310	Rim	13	6	2.5	Geometric	Exterior	10YR 7.3 very pale brown	10YR 8.2 verry pale brown	Sufficient
426	310	Carination	12	5	1.7	Geometric	Exterior	7.5YR 6.3 light brown	7.5YR 7.3 pink	Sufficient
427	325	Carination	12	7	4	Geometric	Exterior	10YR 7.3 very pale brown	10YR 7.4very pale brown	Insufficient
428	310	Rim	23	5	3	Geometric	Exterior	2.5YR 7.6 light red	2.5YR 7.6 light red	Sufficient
429	312	Rim	23	9	4.1	Geometric	Exterior	10YR 7.2 light gray	10YR 7.2 light gray	Insufficient
430	318	Rim	29	5	3.8	Geometric	Exterior	5YR 7.4Pink	5YR 7.4 Pink	Sufficient
431	325	Rim	19	4	4.5	Floral	Exterior	4.4reddish brown	5YR4.6yellowish red	Sufficient
432	332	Base	9	8	5.3	Geometric	Exterior	2.5Y 7.4pale yellow	10YR 7.2 light gray	Sufficient
433	339	Base	23	7	3.4	None		10YR 7.3 very pale brown	7.5YR 7.4 pink	Insufficient
434	342	Rim	19	6	2.5	Geometric	Exterior	2.5YR 7.6 light red	4.5PB3.1 dark bluish gray	Insufficient
435	341	Rim	16	7	3.6	Geometric	Exterior	2.5Y 8.2 pale yellow	10YR 7.4very pale brown	Sufficient
436	364	Rim	10	6	3.4	Geometric	Exterior	10YR 6.6brownish yellow	10R 5.6 red	Sufficient
437	355	Rim	21	4	4.1	Geometric	Exterior & Interior	10 R 5.8 RED	10 R 8/4 very pale brown	Sufficient
438	363	Rim	9	8	5.4	Anthropomorphic	Exterior	10YR 8.2 verry pale brown	5YR 7.6 reddish yellow	Sufficient
439	349	Rim	16	6	2	Floral	Exterior	10YR 6.4 light yellowish brown	10YR 5.3brown	Sufficient
440	349	Base	17	9	6.6	None		2.5YR 6.6light red	7.5YR 8.4pink	Insufficient

Sialk

ID	Context No	Element	Diameter (cm)	Thickness (mm)	Height (mm)	Decoration	Place of Decoration	Colour of Exterior	Colour of Core	Firing
5009	5001	body		7	50	geometic	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
5010	5001	rim	260	11	60	geometic	Interior	10YR.7.4 very pale brown	pale brown	sufficient
5011	5001	body		3	35	geometic	Exterior	10R.4.3 weak red	red	sufficient
5013	5001	rim	200	9	40			10YR.7.4 very pale brown	pale brown	sufficient
5014	5001	body		6	38	geometic	Exterior	10R.4.3 weak red	dark red	unsufficient
5015	5001	body		16	40	geometic	Exterior	10R.4.3 weak red	red	
5016	5001	rim	200	3	20	geometic	Exterior	2.5YR.5.4 reddish brown	brown	sufficient
5017	5001	body		5	30	geometic	Interior	5YR 6.6 reddish yellow	red	sufficient
5018	5001	body		9	40	geometic	Exterior	10R.5.6 red	brown	sufficient
5019	5001	body		4	30	geometic	Exterior	2.5YR.5.4 reddish brown	brown	sufficient
5020	5001	rim	180	8	40	geometic	Interior	2.5YR.5.4 reddish brown	pale brown	unsufficient
5021	5001	body		13	60			10YR.7.4 very pale brown	pale brown	unsufficient
5022	5001	body		6	40	geometic	Exterior	10R.4.3 weak red	red	sufficient
5023	5001	body		4	25	geometic	Exterior & Interior	10R.4.3 weak red	red	sufficient
5024	5001	rim	260	4	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5025	5001	body		8	50	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5026	5001	body		4	30	geometic	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5027	5001	rim	240	14	60	geometic	Interior	2.5YR.5.4 reddish brown	pale brown	sufficient
5028	5001	rim	320	14	100	geometic	Interior	2.5YR.5.4 reddish brown	pale brown	sufficient
5029	5001	rim	240	9	60	geometic	Exterior	10YR.7.4 very pale brown	pale brown	sufficient
5030	5001	body		15	50	geometic	Exterior	10R.4.3 weak red	brown	unsufficient
5031	5001	body		11	130	geometic	Interior	10YR.7.4 very pale brown	pale brown	sufficient
5032	5001	body		3	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5033	5001	body		2	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5034	5001	base	40	5	20	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5035	5001	body		5	40	geometic	Exterior	2.5YR.5.6 red	brown	sufficient
5036	5001	body		5	50	animaly	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5037	5001	body		7	40	geometic	Exterior	10R.4.3 weak red	pale brown	unsufficient
5038	5001	base	60	5	15	geometic	Exterior & Interior	2.5YR.5.4 reddish brown	red	sufficient
5039	5001	rim	260	5	25	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5040	5001	rim	160	3	30	geometic	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5041	5001	rim		5	40	geometic	Exterior	7.5YR 6.4 light brown	brown	sufficient
5042	5001	base	60	8	30	geometic	Exterior	10R.5.6 red	red	sufficient
5043	5001	body		5	25	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient

5044	5001	rim	300	8	30	geometic	Interior	5YR 6.6 reddish yellow	red	sufficient
5045	5001	rim	280	5	30	geometic	Interior	10R.4.3 weak red	pale brown	sufficient
5046	5001	rim	120	7	30	geometic	Exterior	10R.5.6 red	red	sufficient
5047	5001	rim	160	6	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5048	5001	rim	300	8	40	geometic	Exterior	10R.5.6 red	red	sufficient
5049	5001	base		55	80			10YR.7.4 very pale brown	pale brown	unsufficient
5050	5001	body		3	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5051	5001	rim	260	8	60	geometic	Exterior	10R.4.3 weak red	red	sufficient
5052	5001	body		7	70	geometic	Exterior	2.5YR.5.4 reddish brown	dark red	unsufficient
5053	5001	body		2	40	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5054	5001	rim	200	8	40	geometic	Exterior & Interior	5YR 6.6 reddish yellow	pale brown	sufficient
5055	5001	body		9	50	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5056	5001	rim	200	14	40			10YR.7.4 very pale brown	pale brown	sufficient
5057	5001	rim	120	4	30	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5058	5001	rim	150	4	50	geometic	Exterior	2.5YR 6.6 light red	red	sufficient
5059	5001	rim	140	5	30	geometic	Exterior	2.5YR.5.4 reddish brown	pale brown	sufficient
5060	5001	rim	400	10	50	geometic	Exterior	10R.5.6 red	red	sufficient
5061	5001	rim	220	11	40	geometic	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
5062	5001	body		3	35			5YR 6.6 reddish yellow	red	sufficient
5063	5001	rim	400	15	40	geometic	Interior	10R.5.6 red	pale brown	sufficient
5064	5001	body		3	20	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5065	5001	body		6	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5066	5001	body		6	30	geometic	Exterior	10R.4.3 weak red	red	sufficient
5067	5001	rim	180	10	40	geometic	Interior	2.5YR.5.4 reddish brown	pb	sufficient
5068	5001	body		7	20	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5073	5002	rim	100	5	40	geometic	Exterior	2.5YR.5.6 red	pale brown	sufficient
5074	5002	rim	430	12	15	geometic	Interior	10YR.7.4 very pale brown	pale brown	sufficient
5075	5002	rim	280	6	40	geometic	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5076	5002	base		3	20	geometic	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5077	5002	rim	260	14	80			10YR.7.4 very pale brown	pale brown	sufficient
5078	5002	body		7	85			10YR.7.4 very pale brown	pale brown	sufficient
5079	5002	body		6	60	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5080	5002	rim	140	5	70	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5081	5002	rim	80	3	30	geometic	Exterior	10R.5.6 red	brown	sufficient
5082	5002	body		4	40	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5083	5002	rim	180	3	30	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5084	5002	rim	120	4	55	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5085	5002	rim	300	10	25	geometic	Exterior	2.5YR.5.4 reddish brown	pale brown	sufficient
5086	5002	rim	200	6	35	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5087	5002	rim	120	3	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5088	5002	rim	140	3	70	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient

5089	5002	rim	120	4	25	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5090	5002	rim	180	9	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5091	5002	rim	140	5	30	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5092	5002	rim		7	50	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5093	5002	rim	300	14	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5094	5002	rim	140	10	35			2.5YR.5.6 red	red	sufficient
5095	5002	body		10	50	geometic	Interior	10R.5.6 red	pale brown	sufficient
5096	5002	rim	280	7	20	geometic	Interior	5YR 6.6 reddish yellow	brown	sufficient
5097	5002	rim	180	4	35	geometic	Exterior	10YR.7.4 very pale brown	pale brown	sufficient
5098	5002	base	80	9	25			10YR. 7.4 very pale brown	pale brown	sufficient
5098	5002	base	80	9	25			10YR.7.4 very pale brown	pale brown	sufficient
5168	5003	body		9	38	geometic	Exterior	5YR.6.6 reddish yellow	red	sufficient
5168	5003	body		9	38	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5169	5003	body		8	40	geometic	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5169	5003	body		8	40	geometic	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5170	5003	body		5	30	geometic	Exterior	10R.4.8 red	red	unsufficient
5170	5003	body		5	30	geometic	Exterior	10R.4.8 red	red	unsufficient
5171	5003	rim		3	55	geometic	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5172	5003	rim	120	4	25	geometic	animaly	5YR 6.6 reddish yellow	red	unsufficient
5173	5003	body		5	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5174	5003	rim	200	3	20	geometic	Exterior & Interior	5YR 6.6 reddish yellow	red	sufficient
5175	5003	rim		4	28	geometic	Exterior	2.5YR.5.4 reddish brown	pale brown	sufficient
5176	5003	rim	260	4	40	geometic	Exterior	10R.4.8 red	red	sufficient
5177	5003	rim	260	2	40	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5178	5003	rim	200	7	15	geometic	Exterior & Interior	10R.4.8 red	dark red	unsufficient
5179	5003	rim		6	40	geometic	Exterior	10R.4.8 red	red	sufficient
5180	5003	body		3	80	animaly	Exterior	5YR 6.6 reddish yellow	red	sufficient
5181	5003	body		5	25	geometic	Exterior & Interior	10R.4.8 red	brown	sufficient
5182	5003	body		7	30	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	unsufficient
5183	5003	rim	120	6	20	geometic	Exterior	5YR 6.6 reddish yellow	brown	unsufficient
5184	5003	body		4	40	geometic	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5185	5003	body		5	30	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5186	5003	base	80	12	15	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5187	5003	base		8	15	geometic	Exterior	10R.4.8 red	pale brown	sufficient
5188	5003	rim		5	45	geometic	Exterior	2.5YR5.6 red	red	sufficient
5189	5003	base	30	3	15	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5190	5003	body		6	40	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5191	5003	rim	200	11	33			2.5YR.5.4 reddish brown	pale brown	sufficient
5192	5003	body		12	50			2.5YR.5.4 reddish brown	pale brown	unsufficient
5193	5003	rim		8	30	geometic	Interior	2.5YR.5.4 reddish brown	pale brown	sufficient
5194	5003	rim	200	10	50	geometic	Interior	10YR.7.4 very pale brown	pale brown	sufficient

5195	5003	rim		7	15	geometic	Exterior & Interior	2.5YR.5.4 reddish brown	dark red	unsufficient
5196	5003	rim	180	5	40	geometic	Interior	10R.4.8 red	pale brown	sufficient
5197	5003	rim	400	13	50	geometic	Interior	5YR 6.6 reddish yellow	pale brown	sufficient
5198	5003	body		7	50	geometic	Exterior	10R.4.8 red	red	sufficient
5199	5003	rim	260	7	80	geometic	Exterior	10R.4.8 red	red	unsufficient
5200	5003	rim	200	10	42	geometic	Interior	5YR 6.6 reddish yellow	pale brown	unsufficient
5201	5003	rim	260	11	50	geometic	Interior	10R.4.8 red	pale brown	unsufficient
5202	5003	rim	260	8	45	geometic	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
5203	5003	rim	300	11	70			10YR.7.4 very pale brown	pale brown	sufficient
5204	5003	body		13	60			10YR.7.4 very pale brown	pale brown	unsufficient
5205	5003	base	500	22	90			10YR.7.4 very pale brown	pale brown	unsufficient
5206	5003	base		10	20			10YR.7.4 very pale brown	pale brown	unsufficient
5207	5003	base	80	8	10			10YR.7.4 very pale brown	dark red	unsufficient
5209	5003	rim	400	9	52	geometic	Exterior	2.5YR 5.8 red	red	sufficient
5210	5003	rim	100	3	25	geometic	Exterior	5YR 6.6 reddish yellow	red	sufficient
5211	5003	body		11	30	geometic	Interior	2.5YR.5.6 red	pale brown	sufficient
5212	5003	rim		8	45	geometic	Exterior	2.5YR.5.4 reddish brown	pale brown	sufficient
5213	5003	body		4	30	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5214	5003	base		15	40	geometic	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5215	5003	body		6	35	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5216	5003	rim	200	7	50	geometic	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5218	5003	body		4	50	geometic	Interior	5YR 6.6 reddish yellow	red	sufficient
5219	5007	body		5	33	geometric	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5220	5007	body		12	40	geometric	Exterior	5YR 6.6 reddish yellow	pale brown	sufficient
5221	5007	body		3	30	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5222	5007	body		10	50	geometric	Exterior	5YR 6.6 reddish yellow	dark red	unsufficient
5223	5007	body		7	60	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5224	5007	body		8	60	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5225	5007	body		6	50	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5226	5007	body	140	4	40	geometric	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5227	5007	body		4	35	geometric	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5228	5007	body		8	20	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5229	5007	body		3	65	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5230	5007	body		4	40	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5231	5007	body		4	30	geometric	Exterior	5YR. 5.4 reddish brown	dark red	unsufficient
5232	5007	body		6	50	geometric	Exterior	5YR. 5.4 reddish brown	red	sufficient
5233	5007	body		7	40	geometric	Exterior	10R.5.6 red	red	sufficient
5234	5007	body		7	35	geometric	Exterior	10R.7.4 very pale brown	red	sufficient
5235	5007	body		7	45	geometric	Exterior	5YR. 5.4 reddish brown	red	sufficient
5236	5007	body		7	30	geometric	Exterior	10R.4.8 red	red	sufficient
5237	5007	body		8	51	geometric	Exterior	10R.5.6 red	red	sufficient

5237	5007	body		3	54	geometric	Exterior	2.5YR.4.4 reddish brown	brown	sufficient
5238	5007	body		6	33	geometric	Exterior	5YR. 6.6 reddish yellow	red	sufficient
5239	5007	body		7	25	geometric	Exterior	7.5YR.6.6 reddish brown	red	sufficient
5240	5007	body		4	25	geometric	Exterior	7.5YR.6.6 reddish brown	red	sufficient
5241	5007	body		4	35	geometric	Exterior	5YR. 6.4 light reddish brown	red	sufficient
5242	5007	rim	120	5	40	geometric	Exterior	5YR.5.6 yellowish red	red	sufficient
5243	5007	rim	140	3	45	geometric	Exterior	5YR.6.6 reddish yellow	red	sufficient
5244	5007	rim		5	40	geometic	Exterior	5YR.6.6 reddish yellow	red	sufficient
5245	5007	base		10	30			10YR. 7.4 very pale brown	red	unsufficient
5246	5007	rim	240	3	60	geometric	Exterior	7.5YR.6.6 reddish brown	red	sufficient
5247	5007	rim	360	15	32			10YR. 7.4 very pale brown	pale brown	unsufficient
5248	5007	rim	300	8	40	geometric	Exterior	10R. 5.6 red	red	sufficient
5249	5007	rim		7	45	geometric	Exterior	7.5YR.6.6 reddish brown	red	sufficient
5250	5007	rim		8	50	geometric	Exterior	10R. 5.6 red	pale brown	sufficient
5250	5007	body		7	40	geometric	Exterior	2.5YR.7.3pale yellow	pale brown	sufficient
5251	5007	body		6	40	geometric	Exterior	2.5YR.7.3pale yellow	pale brown	sufficient
5251	5007	body		6	50			10YR.7.4 very pale brown	pale brown	sufficient
5252	5007	body		5	25	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5253	5007	body		5	30			2.5YR.5.4 reddish brown	dark red	unsufficient
5254	5007	rim	140	6	42	geometric	Exterior	10YR.3.6 dark red	red	sufficient
5255	5007	rim	180	10	45	geometric	Exterior	10YR.3.6 dark red	dark red	unsufficient
5258	5007	body		5	56	geometric	Exterior	10R.5.6 red	gray	unsufficient
5259	5007	body		6	55	geometric	Exterior	5YR.5.6 yellowish red	dark red	unsufficient
5260	5007	body		4	33	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5261	5007	body		5	70	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5262	5007	body		4	43	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5263	5007	body		4	30	geometric	Exterior	10R.5.6 red	red	unsufficient
5264	5007	body		8	35	geometric	Exterior	10R.4.3 weak red	brown	unsufficient
5265	5007	body		7	37	geometric	Exterior	10R.4.8 red	red	sufficient
5266	5007	body		4	25	geometric	Exterior	2.5YR.5.4 reddish brown	brown	sufficient
5267	5007	body		7	45	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5268	5007	body		5	19	geometric	Exterior	5YR.5.6 yellowish red	red	sufficient
5269	5007	body		4	32	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5270	5007	body		4	36	geometric	Exterior	10R.5.6 red	dark red	sufficient
5271	5003	rim		3	40	geometric	Exterior	5YR. 6.6 reddish yellow	red	unsufficient
5271	5007	body		8	57	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5272	5003	rim		4	48	geometric	Exterior	5YR.6.6 reddish yellow	red	sufficient
5272	5007	body		5	46	geometric	Exterior	2.5YR.5.6 red	dark red	sufficient
5273	5003	body		6	45	geometric	Exterior	2.5YR.5.6 red		sufficient
5273	5007	body		9	32	geometric	Exterior	2.5YR.5.4 reddish brown	dark red	unsufficient
5274	5003	body		3	50	geometric	Exterior	5YR.6.6 reddish yellow	red	sufficient

5274	5007	body		6	60			2.5YR.5.6 red	red	sufficient
5275	5007	body		8	34	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5276	5007	body		3	25	geometric	Exterior	10YR.3.6 dark red	brown	sufficient
5277	5007	body		5	81	geometric	Exterior	10YR.3.6 dark red	red	sufficient
5279	5007	body		3	24	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5280	5007	body		7	45	geometric	Exterior	2.5YR.5.4 reddish brown	dark red	unsufficient
5281	5007	rim	360	6	50	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5282	5007	rim	320	6	52	geometric	Exterior	5YR.5.4 reddish brown	dark red	unsufficient
5283	5007	rim	200	5	61	geometric	Exterior & Interior	2.5YR.5.6 red	red	sufficient
5284	5007	rim		8	75	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5285	5007	rim		4	50			2.5YR.5.6 red	red	sufficient
5286	5007	rim	240	7	35	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5288	5007	rim	200	6	37	geometric	Exterior	10YR.3.6 dark red	red	sufficient
5290	5007	rim	300	6	58	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5291	5007	rim	240	9	52	geometric	Exterior	2.5YR.5.4 reddish brown	gray	unsufficient
5292	5007	rim		5	40	geometric	Exterior	10YR.3.6 dark red	red	sufficient
5293	5007	rim	280	6	43	geometric	Exterior & Interior	10YR.3.6 dark red	brown	sufficient
5294	5007	rim	250	12	81	geometric	Exterior	5YR.5.6 yellowish red	pale brown	sufficient
5294	5007	rim	280	9	65			5YR 6.6 reddish yellow	dark red	unsufficient
5295	5007	rim	180	8	25	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5296	5007	rim	100	5	37	geometric	Exterior	5YR.5.6 yellowish red	pale brown	sufficient
5297	5007	rim	300	10	50	geometric	Exterior	5YR.5.6 yellowish red	brown	sufficient
5298	5007	rim	200	4	55	geometric	Exterior	5YR.5.6 yellowish red	brown	sufficient
5299	5007	rim	160	5	20	geometric	Exterior	2.5YR.5.4 reddish brown	brown	sufficient
5300	5007	rim	200	11	36	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5301	5007	rim	230	12	44	geometric	Interior	2.5YR.4.4 reddish brown	brown	unsufficient
5302	5007	rim	100	6	46			2.5YR.5.4 reddish brown	brown	unsufficient
5303	5007	rim		7	37	geometric	Interior	2.5YR.5.4 reddish brown	brown	unsufficient
5304	5007	rim	200	10	40	geometric	Interior	2.5YR.6.4 light reddish brown	brown	sufficient
5305	5007	rim		8	48	geometric	Interior	2.5YR.5.6 red	pale brown	unsufficient
5306	5007	rim	140	4	46	geometric	Exterior	5YR 6.6 reddish yellow		sufficient
5307	5007	rim	100	7	45	geometric	Exterior	5YR.5.6 yellowish red	brown	sufficient
5308	5007	rim	340	9	47			2.5YR.5.6 red	red	unsufficient
5309	5007	rim	220	8	44	geometric	Exterior	5YR 6.6 reddish yellow	brown	unsufficient
5310	5007	rim	270	11	34	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5311	5007	rim	360	10	44	geometric	Interior	2.5YR.5.6 red	pale brown	unsufficient
5312	5007	rim		4	22	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5313	5007	rim	180	8	50	geometric	Exterior	5YR.5.4 reddish brown	brown	sufficient
5314	5007	rim	420	6	30			5YR 6.6 reddish yellow	brown	unsufficient
5315	5007	rim	140	9	27			10YR.5.4 yellowish brown	brown	unsufficient
5316	5007	rim	200	8	28	geometric	Exterior	2.5YR.5.4 reddish brown	brown	unsufficient

5317	5007	rim		5	25	geometric	Exterior	10R.5.6 red	gray	unsufficient
5318	5007	rim	260	10	37			10YR.5.2 grayish brown	gray	unsufficient
5319	5007	rim	200	7	37	geometric	Exterior	2.5YR.6.4 light reddish brown	brown	unsufficient
5320	5007	rim	170	4	35			10R.4.8 red	pale brown	unsufficient
5321	5007	body		5	33	geometric	Exterior	2.5YR.4.4 reddish brown	red	sufficient
5322	5007	body		4	30	geometric	Exterior	2.5YR.5.4 reddish brown	red	sufficient
5323	5007	body		5	33	geometric	Exterior	2.5YR.5.6 red		sufficient
5324	5007	base		25	40			5YR.5.6 yellowish red	gray	unsufficient
5324	5007	body		7	30	geometric	Exterior	10YR.3.6 dark red	red	sufficient
5325	5007	body		3	31	geometric	Interior	10YR.3.6 dark red	dark red	sufficient
5326	5007	rim		8	34			10YR.5.4 yellowish brown	brown	unsufficient
5327	5007	body		6	40	geometric	Exterior	5YR 6.6 reddish yellow	dark red	unsufficient
5328	5007	body		4	15	geometric	Exterior	2.5YR.7.3pale yellowish	pale brown	sufficient
5329	5007	rim		9	30	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5330	5007	rim	120	5	20	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5331	5007	body		10	40	geometric	Exterior	5YR 6.6 reddish yellow	brown	unsufficient
5332	5007	body		10	38			5YR 6.6 reddish yellow	dark red	unsufficient
5333	5007	rim	160	12	45			10YR.5.4 yellowish brown	brown	unsufficient
5334	5007	rim		7	66			7.5YR.5.1gray	dark red	unsufficient
5335	5007	body		5	33			5YR.5.1 gray	gray	unsufficient
5336	5007	rim	360	9	42			10R.4.3 weak red	gray	unsufficient
5337	5007	rim		8	50	geometric	Exterior	2.5YR.7.3pale yellowish	pale brown	unsufficient
5338	5007	base	60	5	20			7.5YR.5.6 strong brown	gray	unsufficient
5339	5007	base	60	5	35			5YR.5.6 yellowish red	red	sufficient
5340	5007	base	60	12	25	geometric	Exterior	2.5YR.5.6 red	dark red	unsufficient
5341	5007	base	100	7	45			10R.5.6 red	brown	unsufficient
5364	5007	body		14	37			2.5YR.6.4 light reddish brown	dark red	unsufficient
5484	5009	rim	100	7	57	geometric	Exterior	10R.5.6 red	red	sufficient
5485	5007	rim	120	10	80	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5486	5007	rim	320	9	45	geometric	Exterior	10R.5.6 red	red	unsufficient
5487	5007	rim	140	6	37	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5488	5007	rim	300	11	51	geometric	Exterior	10R.5.6 red	red	sufficient
5489	5007	body		7	44	geometric	Exterior	10R.5.6 red	brown	unsufficient
5490	5007	rim	140	3	65	geometric	Exterior	10R.5.6 red	red	sufficient
5492	5007	rim	320	5	64	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5493	5007	rim	320	8	46	geometric	Exterior	10R.5.6 red	red	sufficient
5494	5007	body		5	30	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5494	5007	rim	300	10	60	geometric	Interior	2.5YR.5.6 red	red	sufficient
5495	5007	body		5	45	geometric	Exterior	10R.4.3 weak red	gray	unsufficient
5496	5007	rim	400	10	45	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5497	5007	rim	120	7	30	geometric	Exterior	2.5YR.5.6 red	red	sufficient

5498	5007	rim	260	10	60	geometric	Interior	10R.5.6 red	gray	unsufficient
5499	5007	rim	200	5	20	geometric	Interior	2.5YR.5.6 red		sufficient
5500	5007	rim	180	5	50	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5501	5007	rim	400	7	55	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5502	5007	rim	200	8	30	geometric	Interior	2.5YR.5.6 red	brown	sufficient
5503	5007	rim	180	5	35	geometric	Interior	5YR 6.6 reddish yellow	brown	sufficient
5504	5007	rim	190	5	45	geometric	Exterior	2.5YR.5.6 red	gray	unsufficient
5505	5007	rim	180	4	44	geometric	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5506	5007	rim	280	9	57	geometric	Interior	5YR 6.6 reddish yellow	pale brown	unsufficient
5507	5007	rim		9	44	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5508	5007	rim	300	4	44	geometric	Interior	2.5YR.5.6 red	red	sufficient
5509	5007	rim		12	42	geometric	Interior	5YR.5.4 reddish brown	gray	unsufficient
5510	5007	rim	140	4	22	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5511	5007	body		4	25	geometric	Exterior	10R.4.3 weak red	red	sufficient
5512	5007	body		7	46	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5513	5007	body		6	27	geometric	Interior	5YR 6.6 reddish yellow	brown	sufficient
5514	5007	rim	250	9	40	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5515	5007	body		5	45	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5517	5007	body		5	29	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5518	5007	body		5	30	geometric	Exterior	10R.5.6 red	red	sufficient
5518	5007	body		7	44	geometric	Exterior	2.5YR.5.6 red	brown	sufficient
5519	5007	body		4	35	geometric	Exterior	2.5YR.6.4 light reddish brown	gray	sufficient
5519	5007	body		8	50	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5520	5007	body		9	35	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
5521	5007	rim	100	7	40	geometric	Interior	5YR.5.4 reddish brown	gray	unsufficient
5522	5007	body		7	30	geometric	Exterior	5YR 6.6 reddish yellow		sufficient
5523	5007	body		5	25	geometric	Exterior	10R.5.6 red	red	sufficient
5524	5007	rim	140	5	45	geometric	Exterior	2.5YR.6.4 light reddish brown	gray	unsufficient
5525	5007	body		6	30	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
5526	5007	body		11	35	geometric	Interior	2.5YR.5.6 red	brown	sufficient
5527	5007	rim	120	10	20	geometric	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5529	5007	body		7	64	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5530	5007	body		19	20	geometric	Exterior	2.5YR.5.6 red	brown	sufficient
5531	5007	base	120	10	35			2.5YR.5.6 red	dark red	unsufficient
5532	5007	rim	150	8	30	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5533	5007	body		9	34	geometric	Exterior	10R.5.6 red	red	sufficient
5534	5007	body		5	24	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5535	5007	rim	120	7	26	geometric	Interior	10R.5.6 red	pale brown	unsufficient
5536	5007	rim	220	5	76			2.5YR.5 2gryish brown	gray	unsufficient
5537	5007	rim	180	12	44	geometric	Interior	5YR.5.4 reddish brown	pale brown	unsufficient
5538	5007	rim		5	39	geometric	Exterior	10R.5.6 red	red	sufficient

5539	5007	rim	240	9	30			5YR.5.6 yellowish red	brown	sufficient
5540	5007	rim	200	6	45	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5542	5007	rim	120	4	39	geometric	Exterior	5YR.5.6 yellowish red	red	sufficient
5543	5007	base	80	12	35			5YR 6.6 reddish yellow	red	sufficient
5544	5007	rim	200	8	27	geometric	Exterior	2.5YR.5.6 red	brown	sufficient
5545	5007	body		4	37	geometric	Exterior	10R.5.6 red	red	sufficient
5546	5008	body		3	22	geometric	Exterior	2.5YR. 4.4 reddish brown	red	sufficient
5546	5008	body		3	22	geometric	Exterior	2.5YR.4.4 reddish brown	red	sufficient
5547	5008	body		4	28	geometric	Exterior	2.5YR. 4.4 reddish brown	brown	sufficient
5547	8008	body		4	28	geometric	Interior	5YR.5.4 reddish brown	brown	unsufficient
5548	5008	body		5	30	geometric	Interior	2.5YR. 5.6 red	red	sufficient
5548	5008	body		5	30	geometric	Exterior	2.5YR.5.6 ed	red	sufficient
5549	5007	rim	160	5	36	geometric	Exterior	2.5YR. 5.6 red	gray	unsufficient
5549	5007	rim	240	5	36	geometric	Exterior	2.5YR.5.6 ed	gray	sufficient
5550	5008	rim	260	6	39	geometric	Exterior	2.5YR. 5.6 red	red	unsufficient
5550	5008	rim	260	6	39	geometric	Exterior	2.5YR.5.6 ed	red	unsufficient
5551	5008	rim	420	17	70	geometric	Exterior	2.5YR.5.6 ed	pale brown	unsufficient
5551	5024	base	140	11	40			7.5YR 6.4 light brown	brown	unsufficient
5551	5008	rim	420	17	70	geometric	Interior	2.5YR.5.6 ed	pale brown	sufficient
5552	5008	body		2	29	geometric	Exterior	2.5YR. 4.4 reddish brown	red	sufficient
5552	5008	body		2	29	geometric	Exterior	5YR.5.4 reddish brown	red	sufficient
5553	5008	body		2	25	geometric	Interior	2.5YR. 6.4 light reddish brown	red	sufficient
5553	5008	body		2	24	geometric	Interior	5YR.6.3 light reddish brown	red	sufficient
5554	5024	base		12	35			10YR. 7.4 very pale brown	pale brown	unsufficient
5555	5005	rim	280	11	40	geometric	Exterior	2.5YR.5.4 reddish brown	brown	unsufficient
5556	5005	rim	200	6	26	geometric	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5557	5005	body		4	40	geometric	Exterior	2.5YR.6.4 light reddish brown	gray	sufficient
5558	5005	body		8	25	geometric	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5559	5005	body		7	25	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5560	5007	base	120	15	40			5YR 6.6 reddish yellow	red	unsufficient
5561	5005	base	40	8	22	geometric	Exterior & Interior	5YR 6.6 reddish yellow	red	sufficient
5562	5007	body		7	70	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5563	5007	body		6	47	geometric	Exterior	2.5YR.5.6 red	gray	unsufficient
5564	5007	body		4	30			5YR.6.6 reddish yellow	red	sufficient
5564	5007	body		4	30			5YR 6.6 reddish yellow	red	unsufficient
5565	5007	body		7	29	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5567	5007	body		7	25	geometric	Exterior	5YR. 6.6 reddish yellow	red	sufficient
5567	5007	body		7	25	geometric	Exterior	5YR.6.6 reddish yellow	red	sufficient
5568	5007	body		6	34	geometric	Exterior	10R.5.6 red	red	sufficient
5569	5007	body		7	34	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5570	5007	body		13	60	geometric	Exterior	10R. 5.6 red	pale brown	unsufficient

5570	5007	body		13	60	geometric	Interior	10R.5.6 red	pale brown	unsufficient
5571	5007	body		4	20	geometric	Exterior	2.5YR.4.4 reddish brown	gray	unsufficient
5571	5007	body		4	20	geometric	Exterior	5YR.5.4 reddish brown	gray	unsufficient
5572	5007	body		5	22	geometric	Exterior	2.5YR. 5.6 red	red	unsufficient
5572	5007	body		5	22	geometric	Exterior	2.5YR.5.6 ed	red	unsufficient
5573	5007	body		6	36	geometric	Exterior	5YR.5.4 reddish brown	red	sufficient
5574	5007	body		7	44	geometric	Exterior	10YR. 7.4 very pale brown	pale brown	unsufficient
5574	5007	body		7	44	geometric	Interior	10YR.7.4 very pale brown	pale brown	sufficient
5575	5007	rim		7	70	geometric	Interior	10R.5.6 red	red	sufficient
5575	5007	body		7	26	geometric	Exterior	10R.5.6 red	red	sufficient
5577	5007	rim	120	6	36			5YR 6.6 reddish yellow	red	unsufficient
5578	5007	rim	200	6	29			5YR.6/3 light reddish brown	red	sufficient
5578	5007	rim	200	6	29			5YR.6.3 light reddish brown	red	sufficient
5579	5007	rim	300	6	40			5YR.4.1 dark gray	gray	unsufficient
5579	5007	rim	300	6	40			5YR.4.1 dark gray	gray	unsufficient
5580	5007	rim		8	39	geometric		10R.4.3 weak red	red	sufficient
5581	5007	base	120	13	25			5YR 6.6 reddish yellow	red	unsufficient
5582	5007	base	120	12	30			5YR 6.6 reddish yellow	red	unsufficient
5583	5007	base	60	6	12	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5584	5009	body		4	32	geometric	Exterior	5YR. 6.6 reddish yellow	pale brown	sufficient
5584	5009	body		4	32	geometric	Exterior	5YR.6.6 reddish yellow	pale brown	sufficient
5585	5009	body		6	25	geometric	Exterior	10R.5.6 red	red	sufficient
5585	5009	body		6	25	geometric	Exterior	10R.5.6 red	red	sufficient
5586	5009	body		4	39	geometric	Exterior	2.5YR.5.6 ed	pale brown	sufficient
5587	5009	body		6	40	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
5588	5009	body		4	22	geometric	Exterior	5YR. 6.6 reddish yellow	red	sufficient
5588	5009	body		4	22	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5589	5009	body		7	70	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5590	5009	body		5	36	geometric	Exterior	10R.5.6 red	red	sufficient
5591	5009	rim		6	25	geometric	Exterior	2.5YR.5.6 ed	pale brown	unsufficient
5591	5009	rim		6	25	geometric	Exterior	2.5YR.5.6 ed	pale brown	unsufficient
5592	5009	body		8	20	geometric	Exterior	5YR.5.4 reddish brown	brown	unsufficient
5592	5009	body		10	35	geometric	Exterior	5YR 6.6 reddish yellow	pale brown	unsufficient
5593	5009	body		6	25	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5594	5009	body		6	60			2.5YR.5.6 ed	gray	unsufficient
5595	5009	body		3	22	geometric	Exterior	2.5YR.5.6 ed	red	unsufficient
5596	5009	rim		6	40	geometric	Exterior & Interior	10YR.7.4 very pale brown	pale brown	unsufficient
5597	5009	rim		5	32	geometric	Exterior	2.5YR.5.6 ed	red	sufficient
5598	5009	rim	250	4	60	geometric	Exterior	10R.5.6 red	brown	unsufficient
5599	5009	rim	200	6	32	geometric	Exterior	10R.5.6 red	gray	sufficient
5599	5009	rim	200	6	32	geometric	Exterior	10R.5.6 red	gray	unsufficient

5600	5009	rim	150	7	62	geometric	Exterior	10R.4.3 weak red	pale brown	unsufficient
5601	5009	rim	110	8	49	geometric	Interior	2.5YR.5.6 ed	pale brown	unsufficient
5602	5009	rim	200	6	39	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
5603	5009	rim		6	13	geometric	Exterior	2.5YR.5.6 ed	brown	sufficient
5604	5009	rim	320	10	34	geometric	Interior	10YR.7.4 very pale brown	pale brown	unsufficient
5605	5009	base	80	7	30	geometric	Exterior	2.5YR.5.6 ed	brown	unsufficient
5659	5007	rim	400	9	70	geometric	Exterior	10R.5.6 red	gray	unsufficient
5661	5007	rim	240	9	43	geometric	Exterior	5YR.5.6 yellowish red	gray	unsufficient
5662	5009	rim	120	6	34	geometric	Exterior	10R.5.6 red	brown	sufficient
5662	5009	rim	280	10	52	geometric	Exterior	2.5YR.5.6 red	red	sufficient
5663	5007	rim	200	7	331	geometric	Exterior	5YR.5.6 yellowish red	gray	unsufficient
5664	5009	rim	120	5	34	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
5665	5009	rim	200	4	29	geometric	Exterior	5YR.5.4 reddish brown	red	sufficient
5666	5007	rim	260	9	65	geometric	Exterior	2.5YR.4.4 reddish brown		unsufficient
5667	5009	rim	200	8	30	geometric	Exterior	5YR.5.4 reddish brown	brown	sufficient
5668	5009	rim		12	40	geometric	Exterior	10R.5.6 red	red	sufficient
5669	5009	rim	120	5	30	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
5670	5009	rim	200	4	24	geometric	Exterior	5YR.5.4 reddish brown	gray	unsufficient
5671	5009	rim	100	10	28			5YR.5.4 reddish brown	gray	unsufficient
5672	5009	rim	250	8	43			10R.5.6 red	brown	sufficient
5673	5009	rim		10	42			10R.5.6 red	pale brown	sufficient
5674	5007	rim	140	5	25	geometric	Exterior	10R.5.6 red	brown	sufficient
5675	5009	body		4	22	geometric	Exterior	10R.5.6 red	red	sufficient
5676	5024	body		4	22	geometric	Interior	5YR 6.6 reddish yellow	red	unsufficient
5677	5009	body		5	100	geometric	Exterior	10R.4.3 weak red	red	sufficient
5679	5009	body		7	50	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5680	5007	body		12	55	geometric	Exterior	2.5YR.5.6 red	brown	sufficient
5681	5009	body		7	50	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
5682	5007	body		4	34	geometric	Exterior	2.5YR.5.6 red	gray	unsufficient
5683	5009	body		6	30	geometric	Exterior	10R.5.6 red	brown	sufficient
5684	5009	body		3	40	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5685	5009	body		8	32	geometric	Exterior	10R.5.6 red	pale brown	sufficient
5686	5009	body		7	25	geometric	Interior	10R.5.6 red	brown	sufficient
5686	5009	body		13	40	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
5687	5009	base	50	4	20			10YR.7.4 very pale brown	pale brown	sufficient
5688	5009	base	70	12	35	geometric	Exterior	5YR 6.6 reddish yellow	brown	sufficient
5689	5007	rim	200	5	36	geometric	Interior	2.5YR.5.6 ed	red	sufficient
5690	5007	rim	140	5	20	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5691	5007	rim		2	19	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5692	5007	body		8	28	geometric	Exterior	10R.5.6 red	red	sufficient
5694	5007	body		5	22	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient

5695	5007	body		5	40	geometric	Interior	2.5YR.6.4 light reddish brown	brown	sufficient
5696	5007	base	30	4	10			2.5YR.6.4 light reddish brown	brown	sufficient
5697	5007	base	100	14	15			2.5YR.5.4 reddish brown	brown	unsufficient
5698	5007	base	60	12	30			2.5YR.6.4 light reddish brown	brown	unsufficient
5699	5007	base	30	10	20	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
5701	5003	rim		11	24	geometric	Interior	10YR.7.4 very pale brown	pale brown	unsufficient
5702	5003	rim	200	12	50	geometric	Interior	2.5YR.6.4 light reddish brown	pale brown	unsufficient
5709	5024	base		13	29			5YR 6.6 reddish yellow	red	unsufficient
5710	5014	rim	200	10	27			10YR.7.4 very pale brown	pale brown	unsufficient
5711	5014	rim	300	9	46			10YR.7.4 very pale brown	pale brown	unsufficient
5712	5014	body		12	44			2.5YR.5.6 red	dark red	unsufficient
5713	5009	rim	280	13	95	geometric	Exterior	2.5YR.5.6 ed	pale brown	unsufficient
5713	5009	rim	280	13	95	geometric	Interior	2.5YR.5.6 ed	pale brown	unsufficient
5714	5009	rim	260	9	52	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
5715	5009	rim	140	6	26	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5716	5009	rim	150	4	28	geometric	Exterior	10R.5.6 red	brown	sufficient
5717	5009	rim	200	5	26	geometric	Exterior	2.5YR.5.6 ed	red	sufficient
5718	5009	body		2	35	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5719	5009	base	140	15	50	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
5720	5009	base		9	15			2.5YR.5.6 ed	brown	unsufficient
5721	5009	base	40	4	15			2.5YR.6.4 light reddish brown	brown	unsufficient
5722	5009	base		6	30	geometric		2.5YR.5.6 ed	brown	unsufficient
5723	5009	base		4	20	geometric	Exterior & Interior	2.5YR.5.6 ed	brown	sufficient
5724	5009	body		3	24	geometric		2.5YR.5.6 red	red	sufficient
5725	5007	body		4	80	geometric		5YR 6.6 reddish yellow	brown	sufficient
5727	5009	rim	220	10	49			2.5YR.6.4 light reddish brown	pale brown	unsufficient
5728	5007	rim	160	4	30	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5729	5009	rim	200	8	50	geometric	Exterior	10R.5.6 red	red	sufficient
5730	5007	rim	260	3	50	geometric	Exterior	5YR.5.6 yellowish red	gray	unsufficient
5731	5009	rim		6	28	geometric	Exterior	10R.5.6 red	red	sufficient
5732	5007	rim	260	11	36	geometric	Exterior	5YR 6.6 reddish yellow	gray	unsufficient
5733	5009	rim	100	3	44			2.5YR.4.4 reddish brown	gray	unsufficient
5734	5007	base	40	4	30	geometric	Exterior	2.5YR.5.6 red	brown	sufficient
5735	5007	base	60	8	40	geometric	Exterior	10R.5.6 red	brown	unsufficient
5882	5003	body		7	35	geometric	Exterior	10R.5.6 red	red	sufficient
5883	5003	rim		5	36	geometric	Interior	10YR.7.4 very pale brown	red	unsufficient
5884	5003	body		4	37	geometric	Exterior	5YR 6.6 reddish yellow	red	unsufficient
5885	5010	rim	320	15	86	geometric	Interior	10R.5.6 red	gray	unsufficient
5886	5010	rim	280	14	65	geometric	Interior	10R.5.6 red	gray	unsufficient
5887	5010	rim	280	10	36	geometric	Exterior	2.5YR.5.4 reddish brown	pale brown	unsufficient
5888	5010	rim	160	7	34	geometric	Exterior	5YR 6.6 reddish yellow	pale brown	unsufficient

5889	5010	rim	120	7	34	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
5890	5010	rim	140	5	69	geometric	Exterior	2.5YR.5.6 ed	red	unsufficient
5891	5010	rim	200	10	89	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
5892	5010	body		6	32	geometric	Exterior	2.5YR.5.4 reddish brown	brown	unsufficient
5893	5007	body		5	23	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
5893	5010	body		10	30	geometric	Exterior	10R.5.6 red	brown	unsufficient
6058	5007	rim	120	7	40	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6059	5007	base	30	3	12			2.5YR.6.4 light reddish brown	brown	sufficient
6088	5026	body		6	55	geometric	Interior	5YR 6.6 reddish yellow	gray	unsufficient
6089	5026	body	150	14	35			5YR.5.4 reddish brown	brown	unsufficient
6090	5026	rim	90	11	63	geometric	Interior	5YR.5.4 reddish brown	brown	unsufficient
6091	5026	base		16	30			2.5YR.5.6 red	brown	unsufficient
6092	5026	base		13	55			5YR.5.4 reddish brown	brown	unsufficient
6093	5026	base	120	14	30			10YR.7.4 very pale brown	brown	unsufficient
6094	5026	body		12	90			10YR.7.4 very pale brown	brown	unsufficient
6095	5026	base		15	90			5YR.5.4 reddish brown	brown	unsufficient
6335	5024	rim	200	15	51			10YR.7.4 very pale brown	brown	unsufficient
6531	5024	body		4	40	geometric	Exterior & Interior	10R.4.3 weak red	red	unsufficient
6532	5024	rim	160	7	40	geometric	Interior	10R.4.3 weak red	brown	unsufficient
6533	5024	rim	200	10	60	geometric	Interior	10R.5.6 red	gray	sufficient
6534	5024	rim	200	10	40	geometric	Interior	10YR.5.4 yellowish brown	pale brown	unsufficient
6536	5024	rim	200	10	34			10R.5.6 red	pale brown	unsufficient
6537	5024	rim	320	15	54	geometric	Interior	10YR.7.4 very pale brown	brown	unsufficient
6538	5024	rim	260	10	40	geometric	Interior	2.5YR.5.6 ed	gray	unsufficient
6539	5024	rim	360	10	30			10YR.7.4 very pale brown	pale brown	unsufficient
6540	5024	rim	300	9	40			10YR.5.4 yellowish brown	gray	unsufficient
6541	5024	rim	260	9	20	geometric	Interior	2.5YR.5.4 reddish brown	pale brown	unsufficient
6541	5007	rim	400	6	50	geometric	Interior	5YR.5.4 reddish brown	pale brown	unsufficient
6542	5024	rim	320	11	45			10YR.7.4 very pale brown	brown	unsufficient
6543	5024	rim	360	13	22	geometric	Interior	2.5YR.5.4 reddish brown	brown	unsufficient
6544	5024	body		9	30	geometric	Interior	10YR.7.4 very pale brown	pale brown	unsufficient
6545	5024	rim		12	40	geometric	Interior	10YR.5.4 yellowish brown	brown	unsufficient
6546	5024	rim	200	10	40			10YR.7.4 very pale brown	pale brown	unsufficient
6547	5024	rim	240	7	30	geometric	Exterior	2.5YR.5.6 ed	brown	unsufficient
6548	5024	rim	380	7	20			10YR.7.4 very pale brown	pale brown	unsufficient
6549	5024	body		8	25	geometric	Exterior	2.5YR.5.6 ed	brown	unsufficient
6550	5024	body		11	75			10R.5.6 red	brown	unsufficient
6552	5024	base	140	13	52			10R.4.3 weak red	dark red	unsufficient
6553	5024	base	180	18	40			10R.4.3 weak red	dark red	unsufficient
6555	5024	base	100	11	33			2.5YR.5.6 ed	brown	unsufficient
6564	5010	base	140	17	40			7.5YR 6.4 light brown	pale brown	unsufficient

6565	5010	body		13	37			7.5YR 6.4 light brown	pale brown	unsufficient
6566	5010	body		5	25	animaly	Exterior	5YR 6.6 reddish yellow	red	sufficient
6567	5010	body		5	15	geometric	Interior	5YR 6.6 reddish yellow	red	sufficient
6568	5011	rim	240	7	34			10YR.7.4 very pale brown	brown	unsufficient
6569	5011	rim	140	12	43	geometric	Exterior	10YR.7.4 very pale brown	brown	unsufficient
6570	5011	rim	420	7	40	geometric	Interior	10R.5.6 red	brown	unsufficient
6571	5011	rim	460	8	53	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
6572	5011	base	140	15	40			10YR.7.4 very pale brown	gray	unsufficient
6573	5011	rim	220	13	55	geometric	Interior	5YR 6.6 reddish yellow	pale brown	sufficient
6574	5011	rim	300	13	86	geometric	Interior	10R.5.6 red	pale brown	sufficient
6575	5021	rim	180	7	62	geometric	Interior	10R.4.3 weak red	brown	sufficient
6576	5011	rim	200	8	36	geometric	Exterior	2.5YR.5.6 red	pale brown	unsufficient
6577	5011	rim	240	8	39	geometric	Exterior & Interior	10R.4.3 weak red	red	sufficient
6582	5021	rim	180	7	25			5YR 6.6 reddish yellow	red	sufficient
6583	5021	rim	200	4	34	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6584	5021	base	200	10	50			10YR.7.4 very pale brown	pale brown	unsufficient
6585	5021	body		15	33			2.5YR.5.6 red	pale brown	unsufficient
6586	5021	rim	240	5	40			10R.4.3 weak red	red	sufficient
6587	5021	body		5	20	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6588	5021	rim	260	7	37			10R.5.6 red	pale brown	sufficient
6589	5021	base	120	13	60			10YR.7.4 very pale brown	pale brown	unsufficient
6589	5021	body		7	35	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6590	5021	body		11	30	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
6591	5021	base	100	11	40			10R.5.6 red	pale brown	unsufficient
6592	5021	base	80	7	35			2.5YR.5.6 red	red	sufficient
6593	5021	base	60	5	40	geometric	Exterior	5YR.5.4 reddish brown	red	sufficient
6594	5021	rim	40	6	20	geometric	Exterior & Interior	10R.5.6 red	pale brown	sufficient
6595	5021	rim	200	5	26	geometric	Interior	10R.5.6 red	pale brown	sufficient
6596	5021	rim	240	13	53	geometric	Interior	10YR.7.4 very pale brown	pale brown	unsufficient
6597	5021	rim	320	13	40	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
6598	5021	rim	400	10	35	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
6599	5021	handel		26	50	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient
6600	5023	body		5	24	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6601	5023	rim	300	12	51			10YR.7.4 very pale brown	pale brown	unsufficient
6602	5024	base	40	6	30	geometric	Exterior	10R.5.6 red	red	sufficient
6603	5024	body		4	25	geometric	Exterior	10R.5.6 red	red	sufficient
6604	5024	rim	160	7	22	geometric	Interior	10R.5.6 red	red	sufficient
6605	5024	rim	240	6	38	geometric	Interior	10R.5.6 red	red	unsufficient
6606	5024	body		13	75			10YR.7.4 very pale brown	pale brown	unsufficient
6607	5024	base	140	18	80			10YR.7.4 very pale brown	pale brown	unsufficient
6608	5026	body		5	37	geometric	Exterior	10R.5.6 red	red	sufficient

6609	5026	rim	380	12	60			10YR.7.4 very pale brown	pale brown	unsufficient
6611	5026	base	200	15	80			10YR.7.4 very pale brown		unsufficient
6612	5026	body		13	70			10YR.7.4 very pale brown		unsufficient
6613	5026	body		15	30			10YR.7.4 very pale brown	pale brown	unsufficient
6614	5026	rim	200	10	54	geometric	Interior	2.5YR.5.6 red	pale brown	unsufficient
6615	5026	rim	220	10	30			10YR.7.4 very pale brown	pale brown	unsufficient
6757	5009	rim	340	13	100	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
6758	5024	rim	400	15	75			10YR.7.4 very pale brown	pale brown	unsufficient
6759	5009	rim		10	39	geometric	Exterior	10R4.3 weak red	brown	unsufficient
6759	5009	rim		10	39	geometric	Exterior	10R.4.3 weak red	brown	unsufficient
6760	5024	rim		6	30			5YR 6.6 reddish yellow	gray	unsufficient
6761	5007	rim	100	4	52	geometric	Exterior	5YR 6.6 reddish yellow	red	sufficient
6762	5007	body		3	55	geometric	Exterior	2.5YR.5.6 ed	gray	unsufficient
6763	5003	body		6	50	geometric	Exterior	2.5YR.5.6 ed	brown	unsufficient
6764	5007	rim		7	21	geometric	Exterior	10R.5.6 red	red	unsufficient
6765	5023	rim	400	14	97			10YR.7.4 very pale brown	pale brown	unsufficient
6766	5023	rim	220	7	23			10YR.7.4 very pale brown	pale brown	unsufficient
6767	5023	body		15	70			10YR.7.4 very pale brown	pale brown	unsufficient
6768	5023	body		13	70			10YR.7.4 very pale brown	pale brown	unsufficient
6800	5026	rim	160	7	86	geometric	Exterior	2.5YR.5.6 red	brown	unsufficient
6801	5030	base	130	11	7	geometric	Exterior	10R.5.6 red	gray	unsufficient
6802	3030	base		13	10			5YR.5.4 reddish brown	pale brown	unsufficient
6803	5017	rim		20	86			10YR.7.4 very pale brown	pale brown	sufficient
6804	5017	body		15	68			5YR.5.4 reddish brown	brown	sufficient
6805	5021	rim	320	14	20			10YR.7.4 very pale brown	pale brown	unsufficient
6806	5021	rim	200	6	46			5YR 6.6 reddish yellow	pale brown	sufficient
6807	5023	rim		18	86			10YR. 7.4 very pale brown	pale brown	unsufficient
6863	5034	body		15	99			5YR 6.6 reddish yellow	brown	unsufficient
6864	5034	body	80	8	21			5YR 6.6 reddish yellow	gray	unsufficient
6865	5034	body		15	67			10YR.7.4 very pale brown	pale brown	unsufficient
6866	5034	base		14	70			10YR.7.4 very pale brown	gray	unsufficient
6867	5034	body	120	8	44			10YR.7.4 very pale brown	brown	unsufficient
6868	5034	rim		11	35			10YR.7.4 very pale brown	brown	unsufficient
6869	5034	body		15	51			10YR.7.4 very pale brown	brown	unsufficient
6870	5037	rim	180	18	64			10YR.7.4 very pale brown	brown	unsufficient
6872	5037	body		14	54			5YR 6.6 reddish yellow	brown	unsufficient
6873	5037	body		12	57			5YR 6.6 reddish yellow	brown	unsufficient
6874	5037	rim		7	57	geometric	Interior	2.5YR.5.6 red	red	sufficient
6874	5037	base		9	50	geometric	Interior	2.5YR.5.6 red	brown	unsufficient
6875	5037	body		14	52			10YR.7.4 very pale brown	brown	unsufficient
6876	5037	body		12	35			7.5YR 6.4 light brown	brown	unsufficient

6877	5037	body		11	30			7.5YR 6.4 light brown	brown	unsufficient
6878	5037	body		10	55			2.5YR.5.6 red	brown	unsufficient
6879	5037	base		10				2.5YR.5.6 red	brown	unsufficient
6880	5037	body		13	42			10YR.7.4 very pale brown	brown	unsufficient
6881	5037	rim	120	16	40			10YR.7.4 very pale brown	brown	unsufficient
6882	5037	rim	400	18	109			10YR.7.4 very pale brown	brown	unsufficient
6883	5037	rim	400	18	59			10YR.7.4 very pale brown	brown	unsufficient
6884	5037	rim	160	14	30			10YR.7.4 very pale brown	brown	unsufficient
6885	5037	rim	200	10	45			2.5YR.5.6 red	brown	unsufficient
6886	5041	body		10	45			2.5YR.5.6 red	brown	unsufficient
6887	5040	rim		13	45			2.5YR.5.6 red	brown	unsufficient
6888	5040	body		10	39			5YR.5.4 reddish brown	brown	unsufficient
6889	5040	rim		3	20	geometric	Exterior	2.5YR.5.6 red	red	sufficient
6890	5040	rim	100	9	33			10YR.7.4 very pale brown	brown	unsufficient
6904	5041	rim		22	59			10YR.7.4 very pale brown	brown	unsufficient
6904	5009	rim		10	52			10YR.7.4 very pale brown	pale brown	unsufficient
6905	5009	rim	300	14	58			10YR.7.4 very pale brown	pale brown	unsufficient
6906	5009	rim	400	14	42			10YR.7.4 very pale brown	pale brown	unsufficient
6907	5009	base		19	30			10YR.7.4 very pale brown	pale brown	unsufficient
6951	5026	base		13				5YR.5.6 yellowish red	brown	unsufficient
6952	5026	base		12	10			5YR.5.4 reddish brown	brown	unsufficient
6953	5026	rim	180	16	77			10YR. 7.4 very pale brown	brown	unsufficient
6954	5017	rim	300	10	51	geometric	Interior	2.5YR.5.6 ed	pale brown	unsufficient
6955	5017	rim	250	12	38	geometric	Interior	10R.5.6 red	pale brown	unsufficient
6956	5037	base		15	25			10YR. 7.4 very pale brown	pale brown	unsufficient
6957	5037	base		17	20	geometric	Exterior	10YR. 7.4 very pale brown	pale brown	unsufficient
6958	5046	rim	500	15	46			10YR.7.4 very pale brown	pale brown	unsufficient
6959	5049	rim	200	11	86			2.5YR.5.6 red	gray	unsufficient
6960	5049	body		12	53			5YR.5.4 reddish brown	gray	unsufficient
6961	5049	body		12	60			10YR.7.4 very pale brown	pale brown	unsufficient
6962	5046	rim		12	48			10R.5.6 red	pale brown	unsufficient
6963	5046	base		11	54			10YR.7.4 very pale brown	pale brown	unsufficient
6964	5046	rim		10	52			10YR.7.4 very pale brown	pale brown	unsufficient
6965	5046	rim		15	67			10YR.7.4 very pale brown	pale brown	unsufficient
6966	5046	rim		18	61			10YR.7.4 very pale brown	pale brown	unsufficient
6967	5026	base	150	12	10			5YR.5.4 reddish brown	gray	unsufficient
6968	5026	rim	200	8	30			2.5YR. 5.6 red	brown	unsufficient
6969	5046	base		14	25			10YR.7.4 very pale brown	pale brown	unsufficient
6970	5046	base		10	50			10YR.7.4 very pale brown	pale brown	unsufficient
6971	5026	body		12	83			2.5YR.6.6 light red	brown	unsufficient
	5007	base	40	13	15	geometric	Exterior	10YR.7.4 very pale brown	pale brown	unsufficient

5004	5001	rim	260	10	45	geometic	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
	5004									
	5004									
6551	5024	base	120	14	50			10YR.7.4 very pale brown	pale brown	unsufficient
6554	5024	base	120	15	40			10YR.7.4 very pale brown	pale brown	unsufficient
6535	5024	rim	320	13	50	geometric	Interior	10R.5.6 red	brown	unsufficient
6861	5030	base	300	15	25			10YR.7.4 very pale brown	brown	sufficient
5070	5002	base	60	6	30			2.5YR. 5.6 red	red	sufficient
7638	5087	rim		13	88			10R.5.6 red	brown	unsufficient
7639	5087	rim	160	8	55			5YR.5.4 reddish brown	brown	unsufficient
7648	5087	rim	300	15	57			10YR.7.4 very pale brown	pale brown	sufficient
7649	5087	rim	250	16	46			10YR.7.4 very pale brown	gray	unsufficient
7647	5087	rim	400	15	48			10YR.7.4 very pale brown	brown	sufficient
7644	5087	body		14	90			10YR.7.4 very pale brown	gray	unsufficient
7643	5087	base	200	20	40			10YR.7.4 very pale brown	gray	unsufficient
7642	5087	base		10	50			10YR.7.4 very pale brown	brown	unsufficient
7645	5087	body		9	50	geometric	Interior	5YR.5.4 reddish brown	gray	unsufficient
7641	5087	body		14	52			10YR.7.4 very pale brown	pale brown	unsufficient
7646	5087	rim	270	13	45			5YR.5.4 reddish brown	brown	unsufficient
7650	5087	body		11	43			5YR.5.4 reddish brown	gray	unsufficient
7652	5085	rim		18	74			5YR.5.4 reddish brown	brown	sufficient
7651	5085	rim	300	11	55			10R.5.6 red	gray	sufficient
7656	5085	rim	240	10	45	geometric	Exterior & Interior	10R.5.6 red	brown	unsufficient
7661	5085	rim	150	7	40	geometric	Interior	10R.5.6 red	brown	unsufficient
7666	5085	rim	160	7	46	geometric	Interior	5YR.5.4 reddish brown	brown	unsufficient
7655	5085	base		5	40	geometric	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
7660	5085	rim	400	16	52			10YR.7.4 very pale brown	brown	sufficient
7654	5085	base	60	8	45			5YR.5.4 reddish brown	gray	unsufficient
7653	5085	rim	100	7	33			10YR.7.4 very pale brown	brown	unsufficient
7619	5080	base		18	77			10YR.7.4 very pale brown	gray	unsufficient
7608	5080	body		17	80			10YR.7.4 very pale brown	brown	unsufficient
7605	5080	rim	350	18	66			10YR.7.4 very pale brown	gray	unsufficient
7604	5080	rim	300	12	52			10YR.7.4 very pale brown	pale brown	sufficient
7601	5080	rim	380	15	64			10YR.7.4 very pale brown	pale brown	sufficient
7599	5080	rim	250	13	60			10YR.7.4 very pale brown	pale brown	sufficient
7603	5080	rim	300	12	43			10YR.7.4 very pale brown	gray	unsufficient
7602	5080	rim	200	10	57			10YR.7.4 very pale brown	brown	sufficient
7600	5080	rim	300	12	55			10YR.7.4 very pale brown	gray	unsufficient
7612	5080	body		10	80			10YR.7.4 very pale brown	gray	unsufficient
7609	5080	body		10	80			10YR.7.4 very pale brown	brown	unsufficient
7610	5080	body		13	102			10YR.7.4 very pale brown	brown	unsufficient

7607	5080	body		12	60			10YR.7.4 very pale brown	brown	unsufficient
7606	5080	body		18	89			10YR.7.4 very pale brown	brown	unsufficient
7614	5080	body		16	78			10YR.7.4 very pale brown	brown	unsufficient
7611	5080	body		12	57			10YR.7.4 very pale brown	brown	sufficient
7615	5080	rim		12	66			10YR.7.4 very pale brown	brown	sufficient
7630	5080	body		15	30	geometric	Interior	10YR.7.4 very pale brown	brown	unsufficient
7637	5080	rim	160	6	25	geometric	Interior	10YR.7.4 very pale brown	pale brown	sufficient
7629	5080	rim	200	6	28	geometric	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
7633	5080	body		14	30	geometric	Interior	10YR.7.4 very pale brown	gray	unsufficient
7623	5080	rim	250	10	68	geometric	Interior	10R.5.6 red	brown	sufficient
7622	5080	rim	200	7	30	geometric	Interior	5YR.5.4 reddish brown	brown	sufficient
7624	5080	rim	160	8	50	geometric	Interior	5YR.5.4 reddish brown	brown	sufficient
7627	5080	rim	250	8	31	geometric	Exterior	10R.5.6 red	brown	sufficient
7625	5080	rim	280	7	37	geometric	Interior	10R.5.6 red	brown	sufficient
7697	5080	rim	200	8	27	geometric	Interior	5YR.5.4 reddish brown	brown	sufficient
7628	5080	rim		10	58			5YR.5.4 reddish brown	brown	sufficient
7617	5080	rim	150	11	94			5YR.5.4 reddish brown	brown	unsufficient
7631	5080	rim	120	6	50	geometric	Exterior & Interior	5YR.5.4 reddish brown	brown	unsufficient
7632	5080	body		8	30	geometric	Exterior & Interior	10R.5.6 red	brown	unsufficient
7626	5080	body		8	37	geometric	Exterior	10R.5.6 red	brown	unsufficient
7620	5080	base		8	44			5YR.5.4 reddish brown	brown	unsufficient
7618	5080	rim	200	9	48			10YR.7.4 very pale brown	gray	unsufficient
7621	5080	base	80	9	29			10YR.7.4 very pale brown	brown	unsufficient
7698	5080	body		11	114	geometric	Exterior & Interior	5YR.5.4 reddish brown	brown	unsufficient
7613	5080	body		10	58			5YR.5.4 reddish brown	brown	sufficient
7616	5080	body		14	30	geometric	Interior	10YR.7.4 very pale brown	gray	unsufficient
7634	5080	rim	200	5	46			2.5YR. 5.6 red	red	sufficient
7636	5080	rim	200	4	36			2.5YR. 5.6 red	red	sufficient
7635	5080	body		3	33			2.5YR. 5.6 red	red	sufficient
7640	5087	rim	260	14	72	geometric	Interior	10R.5.6 red	brown	unsufficient
7517	5067	body		13	64			5YR.5.4 reddish brown	gray	unsufficient
7518	5067	rim	400	11	51			5YR.5.4 reddish brown	gray	unsufficient
7519	5067	base		11	33			10YR.7.4 very pale brown	brown	unsufficient
7520	5067	base		15	10			5YR.5.4 reddish brown	gray	unsufficient
7271	5072	base		12	52			10YR.7.4 very pale brown	gray	unsufficient
7272	5072	rim		10	52			10YR.7.4 very pale brown	pale brown	unsufficient
7274	5072	base		10	55			10YR.7.4 very pale brown	gray	unsufficient
7273	5072	body		13	42			10YR.7.4 very pale brown	brown	sufficient
7523	5072	rim	200	14	96			10YR.7.4 very pale brown	pale brown	sufficient
7521	5072	rim	300	12	72			10YR.7.4 very pale brown	pale brown	sufficient
7522	5072	rim	300	10	60			10YR.7.4 very pale brown	pale brown	sufficient

7524	5072	base		10	52			10YR.7.4 very pale brown	pale brown	sufficient
7525	5072		180	7	31	geometric	Exterior & Interior	2.5YR. 5.6 red	pale brown	sufficient
7275	5074	body		12	66	geometric	Interior	2.5YR. 5.6 red	pale brown	sufficient
7276	5074	body		14	86			10YR.7.4 very pale brown	pale brown	sufficient
7266	5080	rim	400	12	46			10YR.7.4 very pale brown	pale brown	unsufficient
7257	5080	rim	400	11	72			10YR.7.4 very pale brown	pale brown	sufficient
7259	5080	rim	350	15	75			10YR.7.4 very pale brown	gray	unsufficient
7269	5080	rim	350	15	52			10YR.7.4 very pale brown	pale brown	sufficient
7268	5080	body		10	60			10YR.7.4 very pale brown	pale brown	sufficient
7262	5080	rim		18	78			10YR.7.4 very pale brown	pale brown	sufficient
7102	5033	base	40	8	37			5YR.5.4 reddish brown	brown	sufficient
7103	5033	rim	180	10	40	geometric	Interior	5YR.5.4 reddish brown	brown	sufficient
6580	5017	body		11	44			10YR.7.4 very pale brown	brown	sufficient
6579	5017	body		3	20	geometric	Exterior	5YR.5.4 reddish brown	red	sufficient
6862	5030	rim	160	10	60			5YR.5.4 reddish brown	pale brown	unsufficient
6860	5030	rim	200	10	78			5YR.5.4 reddish brown	pale brown	unsufficient
6861	5030	base	300	15	25			10YR.7.4 very pale brown	gray	unsufficient
6856	5030	rim	220		63			10YR.7.4 very pale brown	gray	unsufficient
6867	5030	rim	160	11	52			10YR.7.4 very pale brown	pale brown	unsufficient
6858	5030	rim		4	70	geometric	Exterior	2.5YR. 5.6 red	red	sufficient
6859	5030	rim	200	4	41	geometric	Exterior	2.5YR. 5.6 red	red	sufficient
7158	5052	rim	150	15	77			10YR.7.4 very pale brown	pale brown	sufficient
7110	5060	rim	300	37	100			10YR.7.4 very pale brown	pale brown	unsufficient
7106	5046	rim	450	13	80			10YR.7.4 very pale brown	pale brown	unsufficient
7117	5065	rim		13	70			10YR.7.4 very pale brown	pale brown	sufficient
7116	5065	rim		10	63			10YR.7.4 very pale brown	pale brown	sufficient
7119	5065	base	150	17	20			2.5YR. 5.6 red	pale brown	sufficient
7107	5049	rim		13	53	geometric	Exterior	10R.5.6 red	pale brown	unsufficient
7108	5049	body		7	35	geometric	Exterior	5YR.5.4 reddish brown	pale brown	sufficient
7109	5049	rim		3	29	geometric	Exterior & Interior	2.5YR. 5.6 red	gray	unsufficient
7517	5070	rim	450	17	180			5YR.5.4 reddish brown	gray	unsufficient
7511	5007	rim	150	13	82			10YR.7.4 very pale brown	pale brown	sufficient
7512	5007	rim	400	19	59			10YR.7.4 very pale brown	pale brown	unsufficient
7513	5007	base		18	17			10YR.7.4 very pale brown	pale brown	sufficient
7514	5007	base	120	13				10YR.7.4 very pale brown	pale brown	sufficient
7515	5007	base	100	10	20			10YR.7.4 very pale brown	pale brown	sufficient
7516	5007	base	100	18				10YR.7.4 very pale brown	pale brown	unsufficient
7104	5061	rim	200	10	45			5YR.5.4 reddish brown	pale brown	unsufficient
7105	5061	body		10	127			5YR.5.4 reddish brown	gray	unsufficient
7101	5063	rim		10	59			10YR.7.4 very pale brown	pale brown	sufficient
7100	5063	rim		18	102			10YR.7.4 very pale brown	pale brown	sufficient

7149	5051	base		9	42			5YR.5.4 reddish brown	gray	unsufficient
7150	5051	body		12	64			10YR.7.4 very pale brown	pale brown	sufficient
7148	5051	rim	250	16	102			5YR 6.6 reddish yellow	pale brown	unsufficient
7113	5060	rim	250	15	60			10YR.7.4 very pale brown	pale brown	sufficient
7114	5060	rim	100	11	37			10YR.7.4 very pale brown	pale brown	sufficient
7112	5060	base		17	30			10YR.7.4 very pale brown	pale brown	sufficient
7115	5060	body		8	33			10YR.7.4 very pale brown	pale brown	sufficient
7111	5060	rim	250	19	63			10YR.7.4 very pale brown	pale brown	sufficient
6616	5029	base	150	10	41	geometric	Exterior	2.5YR. 5.6 red	brown	sufficient
6618	5029	body		10	33	geometric	Interior	10R.5.6 red	brown	sufficient
6617	5029	rim	280	7	37	geometric	Interior	10R.5.6 red	brown	sufficient
7254	5080	base	180	22	30			10YR.7.4 very pale brown	pale brown	sufficient
7258	5080	body		11	92			10YR.7.4 very pale brown	pale brown	sufficient
7255	5080	body		18	57			10YR.7.4 very pale brown	pale brown	sufficient
7253	5080	rim	200	18	100			10YR.7.4 very pale brown	pale brown	unsufficient
7260	5080	body		10	73			10YR.7.4 very pale brown	pale brown	unsufficient
7270	5080	rim	300	10	37	geometric	Interior	10R.5.6 red	pale brown	sufficient
7265	5080	rim	250	8	37	geometric	Exterior & Interior	10R.5.6 red	pale brown	sufficient
7264	5080	rim	180	7	58	geometric	Interior	10R.5.6 red	pale brown	sufficient
7263	5080	rim	300	7	35			10R.5.6 red	gray	unsufficient
7256	5080	rim	250	10	63			5YR.5.4 reddish brown	brown	sufficient
7261	5080	base	200	16	15			10R.4.3 weak red	gray	unsufficient
7267	5080	base	250	10	103			10R.4.3 weak red	gray	sufficient
7562	5080	body		10	64			10R.4.3 weak red	pale brown	sufficient
7563	5080	base		14	70			10R.4.3 weak red	pale brown	sufficient
7557	5080	rim	360	13	85			10R.4.3 weak red	pale brown	sufficient
7560	5080	base	140	13	10			10R.4.3 weak red	pale brown	sufficient
7556	5080	rim	180	14	62			10R.4.3 weak red	gray	unsufficient
7555	5080	base		13	8			10R.4.3 weak red	pale brown	sufficient
7554	5080	rim	350	10	70			10R.4.3 weak red	pale brown	sufficient
7558	5080	rim	240	7	67	geometric	Interior	10R.5.6 red	pale brown	sufficient
7559	5080	rim	180	12	90			5YR.5.4 reddish brown	brown	unsufficient
7247	5073	rim	280	13	61			10YR.7.4 very pale brown	pale brown	sufficient
7242	5073	body		16	41			10YR.7.4 very pale brown	gray	unsufficient
7232	5073	rim	380	11	58			10YR.7.4 very pale brown	pale brown	unsufficient
7251	5073	body		10	50			10YR.7.4 very pale brown	pale brown	sufficient
7563	5073	rim	300	15	77			10YR.7.4 very pale brown	pale brown	sufficient
7564	5073	rim	300	13	54			10YR.7.4 very pale brown	pale brown	sufficient
7565	5073	body		13	55			10YR.7.4 very pale brown	pale brown	sufficient
7236	5073	rim	200	14	55			10YR.7.4 very pale brown	pale brown	sufficient
7249	5073	rim	400	14	51			10YR.7.4 very pale brown	pale brown	sufficient

7246	5073	rim	300	10	36			10YR.7.4 very pale brown	pale brown	sufficient
7241	5073	rim		5	10	geometric	Interior	10YR.7.4 very pale brown	pale brown	sufficient
7233	5073	rim	160	6	34	geometric	Exterior & Interior	10YR.7.4 very pale brown	pale brown	sufficient
7240	5073	base	60	4	20	geometric	Exterior	2.5YR. 5.6 red	gray	unsufficient
7235	5073	base		5	50	geometric	Interior	10R.5.6 red	gray	unsufficient
7252	5073	rim		13	35			10YR.7.4 very pale brown	pale brown	sufficient
7239	5073	rim	200	17	48			10R.5.6 red	brown	sufficient
7234	5073	rim	250	10	42			2.5YR. 5.6 red	brown	unsufficient
7237	5073	body		12	48			2.5YR. 5.6 red	brown	unsufficient
7244	5073	base		10	64			5YR.5.4 reddish brown	brown	unsufficient
7245	5073	body		10	40			5YR.5.4 reddish brown	brown	sufficient
7238	5073	body		10	58			2.5YR. 5.6 red	brown	unsufficient
7659	5085	rim	280	10	85			10YR.7.4 very pale brown	brown	sufficient
7658	5085	body		6	15			10YR.7.4 very pale brown	brown	sufficient
7657	5085	body		14	45			10YR.7.4 very pale brown	brown	unsufficient
7662	5085	rim		11	39			10YR.7.4 very pale brown	brown	sufficient
7668	5085	body		8	30			10YR.7.4 very pale brown	brown	unsufficient
7667	5085	rim	300	14	45			5YR.5.4 reddish brown	brown	sufficient
7665	5085	base		14	10			10YR.7.4 very pale brown	gray	unsufficient
7670	5085	body		10	44			10YR.7.4 very pale brown	gray	unsufficient
7663	5085	body		10	43	geometric	Exterior	10YR.7.4 very pale brown	gray	sufficient
7669	5085	body		11	65			10YR.7.4 very pale brown	gray	unsufficient
7664	5085	rim	200	11	46			5YR.5.4 reddish brown	gray	unsufficient
7671	5085	rim	230	3	41	geometric	Exterior	5YR.5.4 reddish brown	red	unsufficient
7673	5085	body		15	58			10YR.7.4 very pale brown	brown	sufficient
7672	5085	body		11	90			10YR.7.4 very pale brown	gray	sufficient
7676	5085	body		16	30			10YR.7.4 very pale brown	pale brown	unsufficient
7675	5085	body		10	60			5YR.5.4 reddish brown	gray	unsufficient
7674	5085	rim	300	11	35			5YR.5.4 reddish brown	gray	unsufficient
601	6002	Rim	210	12	112	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
602	6002	Body		3	17	geometric	Exterior & Interior	2.5YR 6/6	Light Red	Sufficient
1100	6011	Rim	360	17	56	-		10YR 8/3	Very Pale Brown	Sufficient
604	6002	Rim	190	12	49	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
605	6002	Rim	170	11	58	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
632	6003	Rim	360	16	61	-		10YR 8/3	Very Pale Brown	Insufficient
633	6003	Rim	350	15	60	-		10YR 8/3	Very Pale Brown	Insufficient
634	6003	Rim	260	15	61	-		2.5Y 8/3	Pale Yellow	Insufficient
635	6003	Rim	230	16	63	-		10YR 8/3	Very Pale Brown	Insufficient
636	6003	Body		11	54	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
637	6003	Rim	170	15	80	-		2.5Y 8/2	Pale Yellow	Sufficient
638	6003	Rim	260	12	65	-		2.5Y 8/3	Pale Yellow	Insufficient

639	6003	Rim	190	12	40	-		2.5Y 8/2	Pale Yellow	Insufficient
640	6003	Rim	140	13	42	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
641	6003	Rim	200	17	57	-		2.5Y 8/3	Pale Yellow	Insufficient
642	6003	Base	150	10	12	-		10YR 7/4	Very Pale Brown	Insufficient
643	6003	Rim	230	16	37	-		10YR 8/3	Very Pale Brown	Sufficient
644	6003	Rim	180	14	36	-		10YR 8/3	Very Pale Brown	Sufficient
645	6003	Rim	240	11	44	-		2.5Y 8/3	Pale Yellow	Sufficient
646	6003	Body		12	46	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
647	6003	Body		10	45	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
648	6003	Rim	380	22	35	-		2.5Y 8/4	Pale Yellow	Sufficient
649	6003	Rim	500	13	47	-		10YR 7/3	Very Pale Brown	Sufficient
650	6003	Rim	180	10	53	-		10YR 8/3	Very Pale Brown	Sufficient
651	6003	Rim	150	12	32	-		10YR 8/4	Very Pale Brown	Sufficient
652	6003	Body		8	41	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Sufficient
653	6003	Body		9	26	geometric	Exterior & Interior	2.5YR 6/6	Light Red	Sufficient
654	6003	Rim	330	14	69	-		2.5Y 8/4	Pale Yellow	Sufficient
655	6003	Body		11	43	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Insufficient
656	6003	Rim	140	15	56	-		2.5Y 8/4	Pale Yellow	Insufficient
657	6003	Rim	280	16	70	-		10YR 8/3	Very Pale Brown	Insufficient
658	6003	Rim		14	50	-		10YR 7/3	Very Pale Brown	Sufficient
659	6003	Body		13	57	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
660	6003	Body		11	60	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
661	6003	Body		7	47	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
662	6003	Rim	280	14	65	-		2.5Y 8/2	Pale Yellow	Sufficient
663	6003	Rim	120	27	40	-		2.5Y 8/4	Pale Yellow	Insufficient
664	6003	Rim	130	12	27	-		2.5Y 8/4	Pale Yellow	Sufficient
665	6003	Rim	120	8	37	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
666	6003	Body		7	33	-		10YR 8/4	Very Pale Brown	Sufficient
667	6003	Rim	140	8	23	-		2.5Y 8/3	Pale Yellow	Sufficient
668	6003	Rim		25	63	-		2.5YR 6/4	Light Reddish Brown	Insufficient
669	6003	Body		16	53	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
670	6003	Rim	150	11	82	geometric	Exterior & Interior	10R 3/2	Dusky Red	Sufficient
699	6003	Rim	280	8	42	-		2.5Y 8/2	Pale Yellow	Sufficient
700	6003	Rim	370	10	46	-		10YR 8/4	Very Pale Brown	Sufficient
701	6003	Rim	540	14	55	-		2.5Y 8/4	Pale Yellow	Sufficient
702	6003	Body		8	81	geometric	Exterior & Interior	2.5YR 5/6	Red	Sufficient
703	6003	Rim	>540	13	94	-		2.5Y 8/2	Pale Yellow	Sufficient
704	6003	Rim	380	10	35	-		2.5Y 8/2	Pale Yellow	Sufficient
705	6003	Rim	170	11	52	-		2.5Y 8/4	Pale Yellow	Sufficient
706	6003	Rim	240	10	74	geometric	Exterior & Interior	10R 4/6	Red	Sufficient

707	6003	Body		4	62	geometric	Exterior & Interior	10R 6/6	Light Red	Sufficient
708	6003	Rim	290	11	31	-		10YR 7/3	Very Pale Brown	Over-fired
709	6003	Body		10	82	geometric	Exterior & Interior	7.5YR 8/6	Reddish Yellow	Sufficient
710	6003	Rim	520	18	23	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
711	6003	Rim	380	8	48	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
712	6003	Rim		8	31	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
713	6003	Body		8	44	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
714	6003	Body		7	44	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
715	6003	Body		6	48	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Insufficient
716	6003	Body		6	18	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
717	6003	Body		6	40	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
718	6003	Body		10	37	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
719	6003	Body		8	35	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
736	6003	Rim	510	9	33	-		2.5Y 8/3	Pale Yellow	Sufficient
737	6003	Rim	>540	16	67	-		10YR 7/3	Very Pale Brown	Sufficient
738	6003	Base	270	8	30	-		10R 5/4	weak red	Sufficient
722	6003	Rim	380	9	48	-		2.5Y 8/3	Pale Yellow	Over-fired
734	6003	Rim	520	13	41	-		10YR 8/3	Very Pale Brown	Insufficient
735	6003	Rim	180	5	25	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
739	6004	Rim	450	11	127	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
740	6004	Rim	400	7	63	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
742	6004	Base	180	8	35	-		10YR 8/2	Very Pale Brown	Sufficient
743	6004	Body		7	39	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
744	6004	Body		8	29	geometric	Exterior & Interior	7.5YR 7/3	Pink	Sufficient
745	6004	Body		5	36	geometric	Exterior & Interior	2.5YR 7/4	Light Reddish Brown	Sufficient
746	6004	Body		5	33	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
747	6004	Body		8	35	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
748	6004	Rim	230	9	30	-		2.5Y 8/2	Pale Yellow	Insufficient
749	6004	Body		7	41	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
750	6004	Rim	190	16	65	-		2.5Y 8/3	Pale Yellow	Sufficient
751	6004	Body		7	39	geometric	Exterior & Interior	2.5YR 6/6	Light Red	Over-fired
752	6004	Rim	500	8	59	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
753	6004	Rim	440	13	46	-		2.5Y 8/3	Pale Yellow	Sufficient
754	6004	Body		8	50	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
755	6004	Body		10	43	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Sufficient
756	6004	Body		5	50	geometric	Exterior & Interior	2.5YR 5/8	Red	Sufficient
757	6004	Rim		9	40	-		10YR 8/3	Very Pale Brown	Sufficient
758	6004	Rim	270	13	44	-		10YR 8/2	Very Pale Brown	Insufficient
759	6004	Rim	240	9	82	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
760	6004	Rim	340	7	42	-		10YR 7/4	Very Pale Brown	Sufficient

761	6004	Body		9	38	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
762	6004	Body		6	37	geometric	Exterior & Interior	7.5YR 8/2	Pinkish White	Insufficient
763	6004	Rim	270	13	51	-		10YR 8/2	Very Pale Brown	Sufficient
764	6004	Rim	370	10	21	-		10YR 8/3	Very Pale Brown	Sufficient
765	6004	Base	220	14	31	-		10R 6/6	Light Red	Sufficient
766	6004	Body		9	45	geometric	Exterior & Interior	10R 6/6	Light Red	Sufficient
767	6004	Rim	190	7	45	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
768	6004	Rim	210	15	60	-		10YR 8/2	Very Pale Brown	Sufficient
769	6004	Rim	340	19	38	-		2.5Y 8/3	Pale Yellow	Sufficient
770	6004	Rim		6	29			10YR 8/3	Very Pale Brown	Sufficient
771	6004	Body		6	17	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
772	6004	Rim		8	94	-		2.5Y 8/2	Pale Yellow	Sufficient
773	6004	Body		7	22	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
774	6004	Body		8	24	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
775	6004	Rim	310	5	15	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
776	6004	Rim	180	9	17	-		10YR 8/2	Very Pale Brown	Sufficient
777	6004	Body		2	17	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
778	6004	Body		9	31	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
779	6004	Rim	190	5	23	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
780	6004	Body		7	16	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
781	6004	Body		7	32	geometric		10YR 8/3	Very Pale Brown	Sufficient
782	6004	Rim	270	11	36	-		10YR 8/3	Very Pale Brown	Sufficient
783	6004	Body		9	15	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
784	6004	Body		6	23	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
785	6004	Rim	220	5	32	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
786	6004	Body		8	19	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
787	6004	Body		10	31	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
788	6004	Body		4	30	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
789	6004	Base	260	11	35	-		10YR 8/3	Very Pale Brown	Sufficient
791	6004	Body		8	24	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
792	6004	Body		7	51	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
793	6004	Rim		7	61	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
794	6004	Base	120	9	38	-		10YR 8/3	Very Pale Brown	Sufficient
795	6004	Body		7	30	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
796	6004	Body		9	54	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
797	6004	Base	70	5	21	-		5YR 7/4	Pink	Sufficient
798	6004	Body		7	43	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
799	6004	Body		7	27	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
800	6004	Body		10	52	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
801	6004	Body		10	43	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
802	6004	Body		8	31	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient

803	6004	Body		7	27	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
805	6004	Body		7	19	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
806	6004	Body		6	44	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
807	6004	Body		6	19	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
725	6004	Body		8	27	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
726	6004	Body		5	23	geometric		10YR 8/4	Very Pale Brown	Sufficient
808	6005	Rim	260	12	36	-		10YR 8/2	Very Pale Brown	Sufficient
809	6005	Rim	490	15	44	-		10YR 8/2	Very Pale Brown	Over-fired
810	6005	Body		8	47	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
811	6005	Rim	350	7	81	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
812	6005	Rim	220	7	37	-		10Yr 8/3	Very Pale Brown	Sufficient
813	6005	Body		7	39	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
814	6005	Rim	400	2	74	-		2.5Y 8/2	Pale Yellow	Sufficient
815	6005	Base	110	7	19	-		10YR 8/2	Very Pale Brown	Sufficient
816	6005	Body		7	40	geometric	Exterior & Interior	7.5YR 7/2	Pinkish Grey	Sufficient
817	6005	Body		8	25	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
818	6005	Rim	240	8	44	-		7.5YR 8/2	Pinkish White	Sufficient
819	6005	Rim	240	11	65	-		10YR 8/3	Very Pale Brown	Over-fired
820	6005	Rim	170	7	37	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
821	6005	Rim	260	9	46	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
822	6005	Rim	240	8	40	-		10YR 8/2	Very Pale Brown	Sufficient
823	6005	Body		12	32	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
824	6005	Rim	170	10	27	-		10YR 8/2	Very Pale Brown	Sufficient
825	6005	Base	170	8	23	-		7.5YR 8/2	Pinkish White	Sufficient
826	6005	Rim	340	6	41	-		10YR 8/2	Very Pale Brown	Insufficient
827	6005	Body		6	30	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
828	6005	Rim	360	7	33	-		10YR 8/2	Very Pale Brown	Sufficient
829	6005	Rim	310	7	32	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
830	6005	Rim	130	15	61	-		2.5Y 8/2	Pale Yellow	Insufficient
831	6005	Rim	130	8	32	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
832	6005	Rim	270	11	32	-		10YR 8/3	Very Pale Brown	Sufficient
833	6005	Rim	300	4	28	geometric	Exterior & Interior	5YR 5/8	Yellowish Red	Sufficient
834	6005	Rim	210	6	37	geometric	Exterior & Interior	10R 4.5/6	Red	Sufficient
835	6005	Rim	330	12	37	-		7.5YR 8/2	Pinkish White	Sufficient
836	6005	Rim	130	7	33	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
837	6005	Rim	270	12	33	-		7.5YR 8/2	Pinkish White	Sufficient
838	6005	Body		4	22	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
839	6005	Body		8	47	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
840	6005	Rim	400	13	36	-		10YR 8/3	Very Pale Brown	Sufficient
841	6005	Rim	130	3	16	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
842	6007	Rim	310	14	56	-		10YR 8/4	Very Pale Brown	Sufficient

843	6007	Rim	300	10	56	-		10YR 8/3	Very Pale Brown	Sufficient
844	6007	Rim	540	13	108	-		10YR 8/2	Very Pale Brown	Sufficient
845	6007	Rim	290	11	42	-		10YR 8/3	Very Pale Brown	Sufficient
846	6007	Body		9	34	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
847	6007	Rim	410	10	46	geometric	Exterior & Interior	7.5YR 8/3	Pink	Sufficient
848	6007	Rim	370	14	54	-		10YR 8/3	Very Pale Brown	Insufficient
849	6007	Body		12	57	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
850	6007	Rim	340	10	44	-		10YR 8/3	Very Pale Brown	Insufficient
851	6007	Rim	290	11	35	-		10YR 8/2	Very Pale Brown	Insufficient
852	6007	Rim	270	10	71	-		10YR 7/3	Very Pale Brown	Sufficient
853	6007	Rim	350	12	27	-		10YR 8/3	Very Pale Brown	Sufficient
854	6007	Rim	220	13	45	-		10YR 8/3	Very Pale Brown	Insufficient
855	6007	Rim	300	13	49	-		2.5Y 8/2	Pale Yellow	Sufficient
856	6007	Rim	270	14	53	-		7.5YR 7/2	Pinkish Grey	Insufficient
857	6007	Body		10	30	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
858	6007	Body		10	57	geometric	Exterior & Interior	10R 5/6	Red	Sufficient
859	6007	Rim	170	10	35	-		5YR 8/4	Pink	Insufficient
860	6007	Rim	170	12	34	-		10YR 8/2	Very Pale Brown	Sufficient
861	6007	Body		5	36	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
862	6007	Body		12	25	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
863	6007	Body		7	37	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
864	6007	Rim		9	26	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
865	6007	Rim	200	10	49			10YR 8/3	Very Pale Brown	Sufficient
866	6007	Rim	230	14	44	-		10YR 7/3	Very Pale Brown	Sufficient
867	6007	Rim	280	9	32	geometric	Exterior & Interior	7.5YR 6/3	Light Brown	Sufficient
868	6007	Rim	190	9	42	-		10YR 8/3	Very Pale Brown	Insufficient
869	6007	Rim	290	10	46	-		10YR 8/3	Very Pale Brown	Sufficient
870	6007	Body		11	40	geometric	Exterior & Interior	7.5YR 8/3	Pink	Insufficient
871	6007	Rim	440	15	42	-		10YR 8/3	Very Pale Brown	Insufficient
872	6007	Rim	200	8	27	-		10YR 8/2	Very Pale Brown	Sufficient
873	6007	Body		7	27	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
874	6007	Rim	330	9	31	-		7.5YR 8/3	Pink	Insufficient
875	6007	Body		17	45	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
876	6007	Rim	390	18	49	-		10YR 8/2	Very Pale Brown	Insufficient
877	6007	Body		5	35	-		10YR 8/3	Very Pale Brown	Sufficient
878	6007	Rim	410	23	79	-		10YR 8/2	Very Pale Brown	Insufficient
879	6007	Body		11	49	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
880	6007	Body		8	26	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
881	6007	Rim	390	16	43	-		10YR 8/2	Very Pale Brown	Sufficient
882	6007	Body		8	35	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
883	6007	Body		4	39	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient

884	6007	Rim	390	7	25	-		10YR 8/2	Very Pale Brown	Insufficient
885	6007	Body		6	24	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
886	6007	Rim	350	8	16	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
887	6007	Rim	320	16	101	-		2.5Y 8/2	Pale Yellow	Sufficient
888	6007	Rim	520	15	49	-		10YR 8/2	Very Pale Brown	Sufficient
889	6007	Rim	490	12	31	-		10YR 8/3	Very Pale Brown	Insufficient
890	6007	Rim	50	8	44	-		7.5YR 7/3	Pink	Insufficient
891	6007	Base	120	16	38	-		10YR 8/3	Very Pale Brown	Insufficient
892	6007	Base	160	8	11	-		7.5YR 7/6	reddish yellow	Sufficient
893	6007	Rim	230	10	64	-		10YR 7/4	Very Pale Brown	Sufficient
895	6007	Base	80	8	28	-		10YR 7/4	Very Pale Brown	Insufficient
896	6007	Body		13	73	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
897	6007	Body		11	57	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
898	6007	Rim	140	18	29	-		10YR 8/3	Very Pale Brown	Insufficient
899	6007	Rim	80	14	41	-		2.5Y 8/2	Pale Yellow	Insufficient
900	6007	Rim	150	10	74	-		2.5Y 8/3	Pale Yellow	Insufficient
901	6007	Rim	210	12	45	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
902	6007	Rim	260	17	33	-		10YR 7/6	Yellow	Insufficient
903	6007	Rim	50	6	43	geometric	Exterior & Interior	2.5YR 8/2	Very Pale Yellow	Sufficient
904	6007	Possible base	?	20	75	-		2.5Y 7/3	Pale Yellow	Insufficient
905	6007	Rim	210	13	39	-		10YR 7/3	Very Pale Brown	Insufficient
906	6007	Rim	17	12	36	-		2.5Y 8/2	Pale Yellow	Insufficient
907	6007	Body		11	46	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
908	6007	Body		13	46	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
909	6007	Rim	21	6	30	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
910	6007	Rim	140	8	20	geometric	Exterior & Interior	7.5YR 6/4	Light Brown	Sufficient
911	6007	Body		14	35	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
912	6007	Body		13	26	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
913	6007	Rim	160	13	25	-		2.5Y 7/4	Pale Yellow	Sufficient
914	6007	Rim	80	12	39	-		2.5Y 8/3	Pale Yellow	Insufficient
915	6007	Rim	70	12	57	-		7.5YR 7/4	Pink	Insufficient
916	6007	Body		11	32	geometric	Exterior & Interior	10YR 7/6	Pale Yellow	Sufficient
917	6007	Body		12	27	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
918	6007	Body		9	36	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
919	6007	Body		10	23	geometric	Exterior & Interior	7.5YR 7/3	Pink	Insufficient
920	6007	Rim	115	12	35	-		2.5Y 7/3	Pale Yellow	Sufficient
921	6007	Body		7	30	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Sufficient
922	6007	Base	190	14	39	-		10YR 7/4	Very Pale Brown	Insufficient
923	6007	Body		6	30	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
924	6007	Body		10	23	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient

925	6008	Rim	21	10	68	-		10YR 8/3	Very Pale Brown	Sufficient
926	6008	Rim		15	43	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Insufficient
927	6008	Body		14	40	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Insufficient
928	6008	Rim	23	10	58	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
929	6008	Body		7	44	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
930	6008	Rim	26	14	34	-		2.5Y 8/4	Pale Yellow	Insufficient
931	6008	Rim	18	16	40	-		10YR 8/3	Very Pale Brown	Insufficient
932	6008	Rim	13	12	57	-		10YR 7/4	Very Pale Brown	Sufficient
933	6008	Rim	16	10	48	-		2.5Y 8/3	Pale Yellow	Insufficient
934	6008	Rim	18	13	59	-		7.5YR 7/4	Pink	Insufficient
935	6008	Body		8	31	geometric	Exterior & Interior	5YR 6/4	Light Reddish Brown	Sufficient
936	6008	Body		8	18	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Insufficient
937	6008	Rim	120	6	23	-		2.5Y 8/2	Pale Yellow	Insufficient
938	6008	Body		9	46	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
939	6008	Body		7	26	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
940	6008	Body		7	29	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
941	6008	Body		8	26	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
942	6008	Body		9	36	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
943	6008	Rim	100	10	24	-		2.5Y 8/2	Pale Yellow	Insufficient
944	6008	Body		9	50	geometric	Exterior & Interior	2.5YR 7/6	Light Red	Insufficient
945	6008	Body		8	33	geometric	Exterior & Interior	2.5YR 5/4	Reddish brown	Sufficient
946	6009	Rim	230	17	55	-		2.5Y 8/4	Pale Yellow	Insufficient
947	6008	Body		9	34	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
948	6009	Rim	200	11	69	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
949	6009	Rim	100	16	63	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
950	6009	Body		15	74	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
951	6009	Rim	60	14	74	geometric		10YR 8/3	Very Pale Brown	Sufficient
952	6009	Rim	180	11	62	-		7.5YR 7/3	Pink	Insufficient
953	6009	Rim	210	17	61	-		2.5Y 8/2	Pale Yellow	Insufficient
954	6009	Body		12	57	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
955	6009	Rim	110	11	60	-		10YR 8/3	Very Pale Brown	Insufficient
956	6009									
957	6009	Body		17	82	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Insufficient
958	6009	Body		10	72	-		2.5Y 8/2	Pale Yellow	Insufficient
959	6009	Rim	240	19	60	-		10YR 8/3	Very Pale Brown	Sufficient
960	6009	Rim	250	12	62	-		10YR 8/3	Very Pale Brown	Insufficient
961	6009	Rim	90	14	50	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
962	6009	Rim	170	16	71	-		10YR 7/3	Very Pale Brown	Insufficient
963	6009	Body		8	65	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Insufficient
964	6009	Rim	170	14	76	-		2.5Y 8/3	Pale Yellow	Insufficient

965	6009	Rim	15	9	29	geometric	Exterior & Interior	5YR 6/6	Reddish Yellow	Sufficient
966	6009	Rim	170	13	59	-		10YR 8/3	Very Pale Brown	Sufficient
967	6009	Rim	200	12	53	-		10YR 8/3	Very Pale Brown	Insufficient
968	6009	Rim	120	21	36	-		10YR 8/2	Very Pale Brown	Insufficient
969	6009	Rim	110	16	49	-		10YR 7/3	Very Pale Brown	Insufficient
970	6009	Body		8	36	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
971	6009	Rim	120	9	57	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
972	6009	Rim	120	19	67	-		10YR 7/3	Very Pale Brown	Sufficient
973	6009	Rim	230	9	52	-		10YR 8/3	Very Pale Brown	Insufficient
974	6009	Rim	170	15	66	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
975	6009	Rim	200	15	34	-		10YR 7/3	Very Pale Brown	Insufficient
976	6009	Rim	120	10	37	geometric	Exterior & Interior	5YR 6/6	Reddish yellow	Insufficient
977	6009	Rim	160	7	45	-		2.5Y 5/1	Grey	Sufficient
978	6009	Body		7	50	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
979	6009	Rim	100	19	65	-		10YR 7/3	Very Pale Brown	Insufficient
980	6009	Body		11	38	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
981	6009	Rim	160	17	56	-		2.5Y 8/3	Pale Yellow	Sufficient
982	6009	Base	14	10	16	-		10YR 7/4	Very Pale Brown	Sufficient
983	6009	Rim	250	12	58	-		7.5YR 8/3	Pink	Sufficient
984	6009	Body		7	25	geometric	Exterior & Interior	7.5YR 8/3	Pink	Insufficient
985	6009	Rim	110	12	33	-		2.5Y 8/4	Pale Yellow	Sufficient
986	6009	Body		9	64	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
987	6009	Body		17	62	geometric	Exterior & Interior	10YR 6/2	Light Brownish gray	Insufficient
988	6009	Body		14	50	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
989	6009	Rim	250	10	34	-		10YR 7/4	Very Pale Brown	Insufficient
990	6009	Body		11	44	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
991	6009	Body		13	67	geometric	Exterior & Interior	2.5Y 7/4	Pale Yellow	Insufficient
992	6009	Rim	130	6	42	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
993	6009	Rim	220	10	21	-		10YR 7/4	Very Pale Brown	Sufficient
994	6009	Rim	120	8	23	geometric	Exterior & Interior	2.5Y 8/4	Pale Yellow	Sufficient
995	6009	Body		9	35	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Sufficient
996	6009	Rim	190	10	63	-		10YR 8/3	Very Pale Brown	Sufficient
997	6009	Rim	70	8	44	geometric	Exterior & Interior	10R 5/6	Red	Sufficient
998	6009	Rim	160	11	51	-		10YR 8/4	Very Pale Brown	Insufficient
1000	6009	Rim	90	8	42	geometric	Exterior & Interior	10YR7/3	Very Pale Brown	Sufficient
1001	6009	Rim	150	13	30	-		10YR 8/3	Very Pale Brown	Insufficient
1002	6009	Body		8	35	geometric	Exterior & Interior	2.5YR 5/4	Reddish Brown	Sufficient
1004	6009	Body		9	42	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
1005	6009	Rim	160	17	53	-		7.5YR 7/4	Pink	Insufficient
1006	6009	Body		9	40	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient

1007	6009	Rim	160	16	39	-		2.5Y 7/3	Pale Yellow	Insufficient
1008	6009	Body		13	47	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
1009	6009	Rim	90	8	37	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
1010	6009	Body		10	44	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Insufficient
1011	6009	Body		11	32	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
1012	6009	Rim	70	7	27	geometric	Exterior & Interior	2.5Y 8/3	Pale Yellow	Sufficient
1013	6009	Base	210	18	36	-		10YR 7/3	Very Pale Brown	Insufficient
1015	6009	Rim	60	10	46	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1016	6009	Rim	150	16	33	-		2.5Y 8/3	Pale Yellow	Sufficient
1017	6009	Body		8	31	geometric	Exterior & Interior	2.5Y 8/2	Pale Yellow	Sufficient
1018	6009	Rim	140	10	42	-		2.5Y 8/3	Pale Yellow	Sufficient
1019	6009	Base	100	19	40	-		10YR 7/3	Very Pale Brown	Insufficient
1020	6009	Body		12	41	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
1021	6009	Body		8	29	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1022	6009	Rim	70	7	27	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
1023	6009	Body		7	33	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
1024	6009	Body		8	25	geometric	Exterior & Interior	2.5YR 5/6	Red	Sufficient
1025	6009	Rim	70	10	23	geometric	Exterior & Interior	10YR 6/6	Light red	Sufficient
1026	6009	Body		8	27	geometric	Exterior & Interior	10YR 5/6	Red	Sufficient
1027	6009	Rim	90	8	24	-		10YR 8/3	Very Pale Brown	Sufficient
1028	6009	Rim	100	9	19	geometric	Exterior & Interior	2.5YR 5/6	Red	Sufficient
1029	6009	Rim	80	13	34	-		10YR 7/3	Very Pale Brown	Insufficient
1030	6009	Body		10	25	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1031	6009	Body		9	19	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
1032	6009	Body		8	27	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1033	6009	Rim	110	8	28	geometric	Exterior & Interior	2.5YR 5/6	Red	Sufficient
1034	6009	Rim	70	8	31	geometric	Exterior & Interior	2.5YR 7/4	Red	Sufficient
1035	6009	Body		6	22	geometric	Exterior & Interior	2.5YR 7/2	Pale Yellow	Sufficient
1036	6009	Body		10	23	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
1037	6009	Body		9	27	geometric	Exterior & Interior	2.5YR 7/2	Light gray	Sufficient
1038	6009	Rim	100	11	29	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
1039	6009	Rim	140	11	32	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1040	6009	Rim	180	12	27	geometric	Exterior & Interior	2.5YR 6/6	Light red	Sufficient
1041	6009	Rim	110	8	25	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
1042	6009	Body		9	23	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
1043	6009	Rim	50	7	21	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1044	6009	Rim	60	8	24	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
1045	6009	Rim	90	15	40	-		10yr 7/4	Very Pale Brown	Sufficient
1046	6009	Body		10	44	geometric	Exterior & Interior	7.5YR 7/3	Pink	Insufficient
1047	6009	Rim	60	9	39	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1048	6009	Rim	110	7	14	geometric	Exterior & Interior	10YR 8/2	Very Pale Brown	Insufficient

1049	6009	Body		10	26	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
1050	6009	Rim	80	8	28	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
1051	6009	Body		8	25	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
1052	6009	Body		12	14	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1053	6009	Rim	140	8	30	-		10YR 8/3	Very Pale Brown	Insufficient
1054	6009	Body		9	25	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Insufficient
1055	6009	Body		11	36	geometric	Exterior & Interior	7.5YR 7/4	Pink	Sufficient
1056	6009	Rim	140	13	25	-		2.5Y 8/3	Pale Yellow	Insufficient
1057	6009	Body		12	30	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
1058	6009	Body		12	39	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1059	6009	Body		26	43	geometric	Exterior & Interior	10YR 5/6	Red	Insufficient
1060	6009	Body		8	45	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Insufficient
1061	6009	Rim	110	9	50	-		10yr 7/4	Very Pale Brown	Sufficient
1062	6009	Rim	140	14	42	-		2.5Y 8/2	Pale Yellow	Insufficient
1063	6009	Body		14	60	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1064	6009	Base	300	13	29	-		10yr 7/3	Pale Yellow	Sufficient
1065	6009	Rim	150	10	20	-		10yr 7/3	Very Pale Brown	Insufficient
1066	6009	Rim	80	10	20	geometric	Exterior & Interior	10yr 5/6	red	Sufficient
1067	6011	Rim	440	15	80	-		2.5Y 8/3	Pale Yellow	Insufficient
1068	6011	Body		12	112	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1069	6011	Rim	170	15	55	-		5YR 6/3	Light Reddish Brown	Insufficient
1070	6011	Rim	250	15	62	-		2.5Y 8/3	Pale Yellow	Insufficient
1071	6011	Body		8	58	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1072	6011	Rim	27	21	80	-		10YR 7/3	Very Pale Brown	Insufficient
1073	6011	Rim	160	18	73	-		10YR 8/2	Very Pale Brown	Insufficient
1074	6011	Rim	280	17	83	-		10YR 7/3	Very Pale Brown	Insufficient
1075	6011	Body		9	45	geometric	Exterior & Interior	10YR 7/2	Light red	Insufficient
1076	6011	Rim	250	18	95	-		2.5Y 8/3	Pale Yellow	Insufficient
1077	6011	Base		13	35	-		10YR 8/3	Very Pale Brown	Insufficient
1078	6011	Body		8	63	geometric	Exterior & Interior	10YR 6/4	Light Reddish Brown	Insufficient
1079	6011	Rim	240	15	33	-		10YR 7/3	Very Pale Brown	Insufficient
1080	6011	Rim	180	20	47	-		2.5Y 8/4	Pale Yellow	Insufficient
1081	6011	Body		14	88	geometric	Exterior & Interior	5YR 6/4	Light Reddish Brown	Insufficient
1082	6011	Rim	140	8	28	-		2.5YR 5/6	Red	Insufficient
1083	6011	Rim	160	14	43	-		10YR 8/4	Very Pale Brown	Sufficient
1084	6011	Rim	240	14	33	-		2.5Y 8/4	Pale Yellow	Sufficient
1085	6011	Body		9	61	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Insufficient
1086	6011	Rim	190	20	54	-		10YR 8/2	Very Pale Brown	Insufficient
1087	6011	Body		8	57	geometric	Exterior & Interior	2.5YR 6/6	Light red	Sufficient

1088	6011	Base	210	9	41	-		2.5YR 5/6	Red	Insufficient
1089	6011	Rim	230	14	51	-		10YR 6/6	light reddish brown	Insufficient
1090	6011	Rim	290	13	52	-		10YR 8/4	Very Pale Brown	Insufficient
1091	6011	Body		8	47	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
1092	6011	Rim	160	7	38	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
1093	6011	Body		8	36	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Insufficient
1094	6011	Body		10	38	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1095	6011	Body		10	57	geometric	Exterior & Interior	5YR 8/2	Pale Yellow	Insufficient
1096	6011	Body		9	32	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Insufficient
1097	6011	Body		9	48	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1098	6011	Rim	150	12	53	-		10YR 7/3	Very Pale Brown	Sufficient
1099	6011	Body		11	65	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
603	6002	Body		13	51	geometric	Exterior & Interior	5YR 5/6	Yellowish Red	Sufficient
1101	6011	Rim	150	8	27	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
1102	6011	Rim	230	8	34	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Sufficient
1103	6011	Rim	120	12	46	-		7.5YR 7/4	Pink	Insufficient
1104	6011	Rim	60	10	38	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
1105	6011	Rim	160	12	34	-		10YR 8/2	Very Pale Brown	Insufficient
1106	6011	Body		10	37	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1107	6011	Rim	110	9	23	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
1108	6011	Body		7	42	geometric	Exterior & Interior	2.5YR 8.4	Pale Yellow	Sufficient
1109	6011	Rim	160	13	29	-		2.5Y 8/2	Pale Yellow	Insufficient
1110	6011	Body		8	38	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
1111	6011	Body		8	32	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1112	6011	Rim	360	8	15	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
1113	6011	Body		14	45	-		2.5Y 8/3	Pale Yellow	Insufficient
1114	6011	Body		11	35	-		10YR 8/4	Very Pale Brown	Sufficient
1115	6011	Rim	90	8	28	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
1116	6011	Body		6	40	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1117	6011	Body		8	47	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Insufficient
1118	6011	Rim	300	13	21	-		2.5Y 8/2	Pale Yellow	Insufficient
1119	6011	Rim	150	18	56	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1120	6011	Body		10	15	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
1121	6011	Body		9	33	geometric	Exterior & Interior	2.5YR 5/4	Reddish Brown	Sufficient
1122	6011	Body		10	29	geometric	Exterior & Interior	7.5YR 6/3	Light Brown	Sufficient
1123	6011	Body		7	22	geometric	Exterior & Interior	5YR 6/6	Reddish Yellow	Sufficient
1124	6011	Body		9	25	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1125	6011	Body		7	35	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1126	6011	Rim	170	6	31	geometric	Exterior & Interior	5YR 7/4	Pink	Insufficient
1128	6011	Rim	80	8	24	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient

1129	6011	Body		10	46	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Insufficient
1130	6011	Rim	120	7	39	geometric	Exterior & Interior	10YR 8/6	Pale Yellow	Insufficient
1133	6011	Rim	60	7	22	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1134	6011	Body		7	28	-		2.5Y 8/3	Pale Yellow	Sufficient
1135	6011	Rim	110	12	52	-		2.5Y 8/2	Pale Yellow	Insufficient
1136	6011	Body		8	48	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1165	6011	Body		7	34	geometric	Exterior & Interior	2.5YR 8/4	Pale Yellow	Sufficient
1166	6011	Rim	310	6	22	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1167	6011	Rim	540	13	55	geometric	Exterior & Interior	10YR 8/3	Very Pale Brown	Sufficient
1168	6011	Body		6	42	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1169	6011	Rim	280	4	26	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1170	6011	Body		7	27	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1171	6011	Rim	500	12	45	geometric	Exterior & Interior	10YR 8/4	Very Pale Brown	Sufficient
1172	6011	Body		4	24	geometric	Exterior & Interior	2.5YR 4/8	Very Pale Brown	Sufficient
1173	6011	Body		6	32	geometric	Exterior & Interior	10YR 8/3	Red	Sufficient
1174	6011	Rim	310	5	46	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1175	6011	Rim	500	12	45	geometric	Exterior & Interior	2.5YR 7/3	Pale Yellow	Sufficient
1176	6011	Rim	370	8	51	geometric	Exterior & Interior	2.5YR 8/3	Pale Yellow	Sufficient
1177	6011	Rim	480	9	40	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1178	6011	Rim	540	13	35	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1179	6011	Rim		16	63	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Sufficient
1180	6011	Rim	510	15	35	geometric	Exterior & Interior	10YR 7/3	Very Pale Brown	Sufficient
1181	6011	Rim	480	6	29	geometric	Exterior & Interior	10YR 7/4	Very Pale Brown	Sufficient
1298	6003	Body		11	49	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Sufficient
1297	6003	Body		13	52	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Sufficient
1299	6003	Rim	150	14	64	-		10yr 7/3	Very Pale Brown	Insufficient
1300	6003	Body		8	41	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1301	6004	Rim	210	10	32	-		7.5yr 8/3	Pink	Sufficient
1302	6004	Body		9	32	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Sufficient
1304	6005	Rim		13	40	-		10yr 7/3	Very Pale Brown	Insufficient
1305	6005	Rim		19	51	-		10yr 7/4	Very Pale Brown	Sufficient
1306	6005	Body		10	20	geometric	Exterior & Interior	10yr 8/4	Very Pale Brown	Insufficient
1307	6007	Rim		7	27	-		10yr 8/4	Very Pale Brown	Sufficient
1308	6007	Rim	220	16	92	-		10yr 7/4	Very Pale Brown	Insufficient
1309	6007	Body		9	35	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1137	6007	Body	180	18	57	-		10yr 4/1	dark gray	Insufficient
1310	6007	Rim		15	38	-		10yr 7/3	Very Pale Brown	Insufficient
1311	6009	Body		16	57	-		10yr 4/1	dark gray	Insufficient
1312	6011	Rim	_	14	115	-		10yr 7/2	Very Pale Brown	Insufficient
1313	6011	Rim	90	9	33	geometric	Exterior & Interior	10yr 7/2	Very Pale Brown	Insufficient
1314	6011	Rim	_	12	36	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient

1315	6011	Rim	160	13	62	-		10yr 8/3	Very Pale Brown	Sufficient
1316	6011	Body	_	8	38	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1317	6011	Body		11	23	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1318	6011	Rim	160	13	21	-		2.5Y 8/3	Pale Yellow	Insufficient
1319	6011	Rim	_	9	22	geometric	Exterior & Interior	10yr 7/6	Pale Yellow	Sufficient
1323	6012	Rim	_	21	45	-		2.5Y 8/3	Pale Brown	Sufficient
1324	6012	Rim	_	22	53	-		10yr 7/4	Very Pale Brown	Insufficient
1325	6012	Rim	200	12	38	-		7.5yr 8/2	Pale Yellow	Insufficient
1326	6012	Rim	160	14	36	-		2.5Y 8/3	Pale Yellow	Insufficient
1327	6012	Rim	200	10	47	geometric	Exterior & Interior	10yr 7/4	Pale Yellow	Insufficient
1328	6012	Rim	350	17	73	-		10yr 47/3	Very Pale Brown	Insufficient
1329	6012	Body	_	8	38	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1330	6012	Body	_	15	57	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1331	6012	Rim	170	11	38	geometric	Exterior & Interior	10yr 6/4	Light Reddish Brown	Insufficient
1190	6012	Rim	240	17	82	-		2.5yr 8/3	Pale Yellow	Insufficient
1191	6012	Rim	_	12	62	-		2.5Y 8/3	Pale Yellow	Insufficient
1192	6012	Body		7	44	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1193	6012	Rim	_	11	88	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1194	6012	Rim	_	12	29	-		2.5yr 8/3	Pale Yellow	Insufficient
1195	6012	Body	_	8	56	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1196	6012	Rim	330	15	51	-		10yr 7/3	Very Pale Brown	Insufficient
1197	6012	Rim		13	65	-		10yr 7/3	Pale Brown	Insufficient
1198	6012	Base	_	13	58	-		2.5Y 8/3	Pale Yellow	Insufficient
1199	6012	Body		10	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1200	6012	Rim	90	6	40	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1201	6012	Body	_	10	59	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1202	6012	Body	_	10	57	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1203	6012	Body	_	9	32	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1204	6012	Body		9	46	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1205	6012	Body		10	27	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1206	6012	Rim	_	6	32	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Sufficient
1207	6012	Rim	120	9	28	-		10yr 5/6	Red	Sufficient
1208	6012	Body		11	49	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1209	6012	Rim	140	8	46	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1210	6012	Body		8	32	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1211	6012	Rim	_	6	7	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Sufficient
1212	6012	Rim	190	12	45	-		2.5Y 8/2	Pale Yellow	Insufficient
1213	6012	Rim	180	17	47	-		10yr 7/3	Very Pale Brown	Insufficient
1214	6012	Body		7	56	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1215	6012	Rim	160	10	48	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient

1216	6012	Body		11	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1629	6012	Rim	_	13	35	-		10yr 6/3	Very Pale Brown	Insufficient
1217	6013	Rim	_	16	76	-		2.5Y 8/3	Pale Yellow	Insufficient
1218	6013	Rim	200	15	30	-		7.5yr 7/3	Pink	Insufficient
1219	6013	Body		11	21	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1220	6013	Body		8	33	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1221	6013	Body		9	45	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1222	6013	Rim	230	21	56	-		10yr 8/2	Very Pale Brown	Insufficient
1223	6013	Body		11	63	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1224	6013	Body		9	39	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Sufficient
1225	6013	Rim	140	8	24	-		10yr 8/3	Very Pale Brown	Insufficient
1226	6013	Rim	320	9	35	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1227	6013	Rim	220	11	39	-		2.5Y 8/3	Pale Yellow	Insufficient
1228	6013	Body		11	52	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1229	6013	Rim	_	13	45	-		10yr 7/3	Very Pale Brown	Insufficient
1230	6013	Body		7	49	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1231	6013	Rim	_	18	58	-		2.5Y 8/3	Pale Yellow	Insufficient
1232	6013	Base	480	18	31	-		10yr 8/4	Very Pale Brown	Insufficient
1233	6013	Rim	390	9	51	-		10yr 7/3	Very Pale Brown	Insufficient
1234	6013	Rim	_	13	44	-		2.5yr 8/3	Pale Yellow	Insufficient
1235	6013	Rim	210	12	45	-		10yr 8/3	Very Pale Brown	Insufficient
1236	6013	Rim	180	7	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1237	6013	Body		11	57	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1238	6013	Rim	_	15	52	-		2.5Y 8/4	Pale Yellow	Insufficient
1239	6013	Rim	_	16	25	-		2.5Y 8/4	Pale Yellow	Insufficient
1240	6013	Body		9	25	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1241	6013	Body		9	24	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1242	6013	Rim	_	10	21	-		2.5Y 8/4	Pale Yellow	Insufficient
1243	6013	Rim	190	10	35	-		2.5Y 8/3	Pale Yellow	Insufficient
1244	6013	Rim	230	13	42	-		2.5Y 8/3	Pale Yellow	Insufficient
1245	6013	Body		10	21	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1246	6013	Rim	150	11	31	-		10yr 7/3	Very Pale Brown	Insufficient
1247	6013	Rim	110	8	20	-		2.5Y 8/3	Pale Yellow	Insufficient
1248	6013	Rim	230	11	57	geometric	Exterior & Interior	2.yr 8/2	Pale Yellow	Insufficient
1249	6013	Rim	_	11	40	-		2.5Y 8/2	Pale Yellow	Insufficient
1250	6013	Rim	_	8	25	-		2.5Y 8/3	Pale Yellow	Insufficient
1251	6013	Body		8	31	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1252	6013	Rim	_	14	31	-		2.5Y 8/4	Pale Yellow	Insufficient
1253	6013	Body		8	24	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1254	6013	Rim	300	14	51	-		2.5Y 8/3	Pale Yellow	Insufficient
1255	6013	Body		11	19	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient

1256	6013	Rim	_	9	17	-		2.5Y 8/4	Pale Yellow	Insufficient
1257	6013	Body		12	13	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1258	6013	Body		9	39	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1259	6013	Body		10	34	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1260	6013	Body		10	37	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1261	6013	Rim	190	11	21	-		2.5Y 8/3	Pale Yellow	Insufficient
1262	6013	Rim	160	8	21	-		2.5Y 8/2	Pale Yellow	Insufficient
1263	6013	Body		8	30	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1264	6013	Rim	220	9	30	-		2.5Y 8/2	Pale Yellow	Sufficient
1335	6013	Rim	_	15	21	-		2.5Y 8/3	Pale Yellow	Insufficient
1336	6013	Body		12	28	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1337	6013	Rim	_	12	68	-		10YR 7/3	Very Pale Brown	Insufficient
1338	6013	Rim	110	7	26	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Sufficient
1339	6013	Rim	130	10	43	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1340	6013	Rim	80	11	26	-		7.5yr 7/3	Very Pale Brown	Insufficient
1341	6013	Rim	_	8	23	-		2.5Y 8/3	Pale Yellow	Insufficient
1342	6015	Rim	250	15	25	-		10yr 7/3	pink	Insufficient
1343	6015	Rim	310	16	50	-		2.5Y 8/3	Pale Yellow	Insufficient
1344	6015	Body		9	21	geometric	Exterior & Interior	7.5yr 8/2	Pinkish White	Insufficient
1345	6015	Body		15	50	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1346	6015	Rim	_	26	45	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1347	6015	Body		13	58	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1348	6015	Body		8	28	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Sufficient
1349	6015	Rim	_	15	26	-		10yr 7/3	Very Pale Brown	Insufficient
1350	6015	Body		15	62	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1351	6015	Rim	180	6	20	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Sufficient
1352	6015	Body		7	30	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Sufficient
1353	6015	Rim	140	8	28	-		2.5Y 8/3	Pale Yellow	Insufficient
1354	6015	Body		10	35	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1355	6015	Body		10	67	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1356	6015	Rim	260	13	33	-		10yr 7/3	Very Pale Brown	Insufficient
1357	6015	Body		7	18	geometric	Exterior & Interior	2.5yr 5/6	Red	Sufficient
1358	6015	Rim	120	9	25	-		10yr 7/3	Very Pale Brown	Insufficient
1359	6015	Body		6	21	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1360	6015	Body		8	20	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1361	6015	Body		10	37	geometric	Exterior & Interior	7.5yr 7/3	Pink	Insufficient
1362	6015	Body		8	48	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Sufficient
1363	6015	Rim	_	12	47	-		10yr 8/3	Very Pale Brown	Insufficient
1364	6015	Rim	110	11	38	-		10yr 8/3	Very Pale Brown	Insufficient
1365	6015	Rim	_	11	40	-		10yr 7/3	Very Pale Brown	Insufficient
1366	6015	Rim	160	13	20	-		10yr 7/3	Very Pale Brown	Insufficient

1367	6015	Rim	_	16	56	-		10yr 8/2	Pale Yellow	Insufficient
1368	6015	Rim	_	11	32	-		10yr 8/4	Very Pale Brown	Insufficient
1369	6015	Body		7	24	geometric	Exterior & Interior	10yr 8/4	Very Pale Brown	Insufficient
1370	6015	Body		5	27	geometric	Exterior & Interior	2.5yr 5/6	red	Insufficient
1371	6015	Body		9	23	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1372	6015	Rim	_	10	17	-		10yr 7/3	Very Pale Brown	Insufficient
1373	6015	Rim	_	15	34	-		10yr 7/3	Very Pale Brown	Insufficient
1374	6015	Body		10	33	geometric	Exterior & Interior	7.5yr 8/2	Pinkish White	Insufficient
1375	6016	Rim	160	7	32	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1376	6016	Rim	370	19	48	-		2.5Y 8/3	Pale Yellow	Insufficient
1377	6016	Body		10	49	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1378	6016	Rim	_	7	72	geometric	Exterior & Interior	7.5yr 6/4	light brown	Insufficient
1379	6016	Rim	200	7	41	geometric	Exterior & Interior	7.5yr 6/4	light brown	Insufficient
1380	6016	Rim	220	7	26	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1381	6016	Rim	_	8	27	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1382	6016	Body		6	26	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1383	6016	Body		5	36	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1384	6016	Rim	_	7	24	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1385	6016	Body		8	42	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1386	6016	Body		9	35	geometric	Exterior & Interior	7.5yr 8/3	Pink	Insufficient
1387	6016	Rim	_	6	24	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1388	6016	Body		8	27	geometric	Exterior & Interior	7.5yr 8/3	Pink	Insufficient
1389	6016	Body		9	38	geometric	Exterior & Interior	5yr 7/4	Pink	Insufficient
1390	6016	Body		9	21	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1391	6016	Body		9	20	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1392	6016	Body		6	19	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1393	6016	Base		11	15	-		2.5Y 8/3	Pale Yellow	Insufficient
1394	6016	Base		7	21	-		10yr 7/3	Very Pale Brown	Insufficient
1395	6016	Rim		6	11	-		2.5Y 8/4	Pale Yellow	Insufficient
1399	6016	Body		9	29	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1400	6016	Body		8	28	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1401	6016	Body		6	28	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1402	6016	Body		10	26	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1403	6017	Body		12	45	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1404	6017	Body		11	52	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1405	6017	Body		12	49	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1406	6017	Body		7	33	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1407	6017	Body		8	39	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1408	6017	Rim	280	11	57	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1409	6017	Body		7	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1410	6017	Body		10	34	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient

1411	6017	Body		10	45	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1412	6017	Body		12	63	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1413	6017	Rim	200	22	66	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1414	6017	Body		12	36	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1415	6017	Body		10	56	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1416	6017	Body		10	29	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1417	6017	Rim	_	6	30	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1418	6017	Body		6	26	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1419	6017	Body		7	26	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1420	6017	Body		10	38	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1421	6017	Body		7	35	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1422	6017	Body		8	28	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1423	6017	Body		12	33	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1424	6017	Body		11	43	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1425	6017	Body		10	47	geometric	Exterior & Interior	10yr 6/3	Pale Brown	Insufficient
1426	6017	Body		6	26	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1427	6017	Body		7	37	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1428	6017	Body		11	40	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1429	6017	Body		11	59	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1430	6017	Body		9	46	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1431	6017	Body		9	29	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1433	6017	Body		6	28	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1434	6017	Body		7	42	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1435	6017	Rim	230	10	41	geometric	Exterior & Interior	5yr 7/4	Pink	Insufficient
1436	6017	Body		9	52	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1437	6017	Body		8	35	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1438	6017	Body		11	24	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1439	6017	Body		8	30	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1440	6017	Body		9	37	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1441	6017	Rim	_	7	35	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1442	6017	Body		6	24	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1443	6017	Rim	_	9	34	-		10yr 7/3	Very Pale Brown	Insufficient
1444	6017	Rim	220	7	15	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1445	6017	Body		8	37	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1446	6017	Body		7	31	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1447	6017	Body		6	24	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1448	6017	Rim	_	8	28	geometric	Exterior & Interior	7.5yr 8/4	Pink	Insufficient
1449	6017	Body		6	27	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1450	6017	Body		8	42	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1451	6017	Body		8	36	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1452	6017	Body		8	29	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient

1453	6017	Body		9	37	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1454	6017	Body		7	29	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1455	6017	Body		8	30	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1456	6017	Body		8	42	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1457	6017	Rim	_	6	27	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Sufficient
1458	6017	Rim	140	7	29	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1459	6017	Rim	100	7	35	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1460	6017	Body		10	20	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1461	6017	Rim	110	5	27	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1462	6017	Body		12	30	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1463	6017	Rim	_	8	17	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1464	6017	Body		9	40	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1465	6017	Body		11	12	-		10yr 7/3	Very Pale Brown	Insufficient
1469	6017	Rim	_	14	69	-		2.5Y 8/3	Pale Yellow	Insufficient
1470	6017	Rim	390	18	63	-		7.5yr 7/3	pink	Insufficient
1471	6017	Rim	_	15	40	-		2.5Y 8/4	Pale Yellow	Insufficient
1472	6017	Base	90	11	36	-		10yr 8/3	Very Pale Brown	Insufficient
1473	6017	Base	280	12	38	-		2.5Y 8/3	Pale Yellow	Insufficient
1475	6017	Rim	_	14	54	-		2.5Y 7/4	Pale Yellow	Insufficient
1476	6017									
1477	6017	Base	140	12	32	-		2.5Y 7/3	Pale Yellow	Insufficient
1478	6017									
1479	6017	Rim	_	14	66	-		10yr 8/3	Very Pale Brown	Insufficient
1480	6017	Rim	_	10	60	-		10yr 8/3	Very Pale Brown	Insufficient
1481	6017	Rim	_	14	55	-		2.5Y 8/2	Pale Yellow	Insufficient
1482	6017	Rim	130	13	50	-		2.5Y 8/3	Pale Yellow	Insufficient
1484	6017	Rim	170	11	35	-		2.5Y 8/4	Pale Yellow	Insufficient
1485	6017	Rim	_	12	100	-		2.5Y 8/4	Pale Yellow	Insufficient
1486	6017	Rim	_	25	44	-		2.5Y 8/3	Pale Yellow	Insufficient
1487	6017	Rim	_	11	52	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1488	6017	Rim	_	16	57	-		2.5Y 8/3	Pale Yellow	Insufficient
1489	6017	Rim	_	14	21	-		2.5Y 8/2	Pale Yellow	Insufficient
1490	6017	Rim	_	11	78	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1491	6017	Rim	_	11	60	-		2.5Y 7/3	Pale Yellow	Insufficient
1492	6017	Rim	270	17	36	-		2.5Y 8/2	Pale Yellow	Insufficient
1494	6017	Rim	_	16	43	-		10yr 8/4	Very Pale Brown	Insufficient
1495	6017	Rim	_	16	63	-		2.5Y 8/3	Pale Yellow	Insufficient
1496	6017	Rim	_	11	36	-		10yr 8/6	Pale Yellow	Insufficient
1497	6017	Rim	_	13	33	-		2.5Y 8/3	Pale Yellow	Insufficient
1498	6017	Rim	_	18	33	-		2.5Y 8/3	Pale Yellow	Insufficient
1499	6017	Rim	_	13	42	-		2.5Y 8/3	Pale Yellow	Insufficient

1500	6017	Rim	_	12	53	-		2.5Y 8/3	Pale Yellow	Insufficient
1501	6017	Base	_	13	40	-		10yr 7/6	Very Pale Brown	Insufficient
1502	6017	Rim	_	11	46	-		10yr 7/3	Pale Yellow	Insufficient
1503	6017	Rim	_	11	29	-		2.5Y 8/3	Pale Yellow	Insufficient
1504	6017	Rim	_	11	34	-		2.5Y 7/3	Pale Yellow	Insufficient
1505	6017	Rim	_	12	39	geometric	Exterior & Interior	2.5yr 7/4	Pale Yellow	Insufficient
1506	6017	Rim	_	11	44	-		7.5yr 7/4	pink	Insufficient
1507	6017	Rim	_	30	61	-		10yr 8/4	Very Pale Brown	Insufficient
1508	6017	Rim	_	18	65	-		2.5Y 8/3	Pale Yellow	Insufficient
1509	6017	Rim	_	15	26	-		2.5Y 8/3	Pale Yellow	Insufficient
1510	6017	Rim	290	12	63	-		2.5Y 8/3	Pale Yellow	Insufficient
1511	6017	Rim	_	11	34	-		2.5Y 7/4	Pale Yellow	Insufficient
1512	6017	Rim	_	10	85	-		2.5Y 8/3	Pale Yellow	Insufficient
1513	6017	Rim	_	12	38	-		2.5Y 7/3	Pale Yellow	Insufficient
1514	6017	Rim	_	15	34	-		2.5Y 8/3	Pale Yellow	Insufficient
1515	6017	Rim	_	15	28	-		2.5Y 8/2	Pale Yellow	Insufficient
1516	6017	Rim	_	12	35	-		2.5Y 8/3	Pale Yellow	Insufficient
1517	6017	Base	100	14	28	-		10yr 8/2	Very Pale Brown	Insufficient
1518	6017	Rim	_	11	55	-		2.5Y 8/3	Pale Yellow	Insufficient
1519	6017	Rim	_	11	31	-		2.5Y 8/3	Pale Yellow	Insufficient
1520	6017	Rim	_	8	40	-		7.5yr 7/3	pink	Insufficient
1521	6017	Rim	90	10	40	-		2.5Y 7/3	Pale Yellow	Insufficient
1522	6017	Rim	_	11	32	-		2.5Y 7/3	Pale Yellow	Insufficient
1523	6017	Rim	_	11	28	-		2.5Y 8/3	Pale Yellow	Insufficient
1524	6017	Rim	_	11	19	-		2.5Y 8/3	Pale Yellow	Insufficient
1525	6017	Rim	_	6	34	-		2.5Y 8/2	Pale Yellow	Insufficient
1526	6017	Rim	_	8	29	-		10yr 7/3	Very Pale Brown	Insufficient
1527	6017	Rim	_	10	37	-		2.5Y 8/3	Pale Yellow	Insufficient
1528	6017	Rim	160	13	64	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1529	6017	Rim	_	7	63	geometric	Exterior & Interior	_	geometric	Sufficient
1530	6017	Base	90	12	27	-		5yr 6/6	redish yellow	Insufficient
1531	6017	Body		5	27	geometric	Exterior & Interior	10yr 4/3	weak red	Sufficient
1836	6017	Body		8	22	_		10yr 8/4	Very Pale Brown	Insufficient
1837	6017	Base	120	11	23	_		10yr 4/4	weak red	Insufficient
1532	6016	Rim	_	_	_	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1533	6018	Rim	_	7	85	geometric	Exterior & Interior	5yr 4/4	redish brown	Insufficient
1535	6018	_			_	_		_	_	
1536	6018	Base	_	16	42	_		2.5Y 8/4	Pale Yellow	Insufficient
1537	6018	Rim	340	13	75	_		2.5Y 7/4	Pale Yellow	Insufficient
1538	6018	Rim	330	18	95	_		2.5Y 8/3	Pale Yellow	Insufficient
1539	6018	Rim	270	16	59	_		2.5y 5/3	light olive brown	Insufficient

1540	6018	Rim	_	12	55	_		2.5Y 7/4	Pale Yellow	Insufficient
1541	6018	Rim	_	19	55	_		10yr 8/3	Very Pale Brown	Insufficient
1542	6018	Rim	_	12	13	_		2.5Y 8/4	Pale Yellow	Sufficient
1543	6018	Rim	_	14	51	_		2.5Y 8/4	Pale Yellow	Sufficient
1544	6018	Base	110	12	29	_		2.5Y 8/3	Pale Yellow	Insufficient
1545	6018	Rim	_	11	31	geometric		10yr 7/3	Very Pale Brown	Sufficient
1546	6018	Rim	_	20	21	_		2.5Y 8/4	Pale Yellow	Sufficient
1547	6018	Rim	_	14	50	_		2.5Y 7/4	Pale Yellow	Insufficient
1548	6018	Rim	150	9	7	_		2.5Y 8/4	Pale Yellow	Sufficient
1549	6018	Rim	_	11	41	_		2.5Y 8/4	Pale Yellow	Insufficient
1550	6018	Rim	170	9	43	_		2.5Y 8/4	Pale Yellow	Sufficient
1551	6018	Base	160	13	25	_		2.5Y 8/3	Pale Yellow	Insufficient
1552	6018	Rim	390	17	71	_		2.5Y 7/4	Pale Yellow	Insufficient
1553	6018	Rim	_	18	51	_		2.5yr 6/4	light yellowish brown	Insufficient
1554	6018	Rim	_	5	20	_		2.5Y 8/4	Pale Yellow	Sufficient
1555	6018	Rim	_	13	35	_		2.5Y 8/4	Pale Yellow	Insufficient
1556	6018	Rim	_	16	52	_		10yr 7/3	Very Pale Brown	Insufficient
1557	6018	Base	_	13	13	_		2.5Y 7/4	Pale Yellow	Insufficient
1558	6018	Rim	_	8	41	_		2.5Y 8/4	Pale Yellow	Insufficient
1559	6018	Rim	_	9	22	_		2.5Y 8/4	Pale Yellow	Insufficient
1560	6018	Rim	_	12	40	_		10yr 7/3	Very Pale Brown	Sufficient
1561	6018	Rim	_	10	35	_		2.5Y 7/4	Pale Yellow	Sufficient
1562	6018	Rim	340	16	40	_		2.5Y 8/4	Pale Yellow	Insufficient
1563	6018	Rim	_	13	40	_		2.5Y 7/3	Pale Yellow	Insufficient
1564	6018	Base	160	15	50	_		2.5Y 8/4	Pale Yellow	Insufficient
1565	6018	Rim	_	22	30	_		2.5Y 8/4	Pale Yellow	Sufficient
1566	6018	Body		12	70	geometric	Inside	2.5yr 8/3	Pale Yellow	Insufficient
1567	6018	Body		14	135	_		2.5Y 7/4	Pale Yellow	Insufficient
1568	6018	Rim	_	10	65	_		2.5Y 8/3	Pale Yellow	Insufficient
1569	6018	Body		10	52	_		10yr 7/3	Very Pale Brown	Insufficient
1570	6018	Body		10	50	_		2.5Y 8/4	Pale Yellow	Insufficient
1571	6018	Rim	_	10	56	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1572	6018	Rim	_	9	48	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1573	6018	Body		8	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1574	6018	Body		9	76	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1575	6018	Rim	_	9	45	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Sufficient
1576	6018	Body		11	54	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1577	6018	Rim	_	10	68	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1578	6018	Body		8	46	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1579	6018	Body		9	34	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient

1580	6018	Body		13	75	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Sufficient
1581	6018	Body		10	8	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1582	6018	Body		12	52	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1583	6018	Body		8	52	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Sufficient
1584	6018	Rim	390	8	30	geometric	Exterior & Interior	2.5yr 7/4	Pale Yellow	Sufficient
1585	6018	Body		8	28	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1586	6018	Body		9	39	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1587	6018	Rim	250	10	4	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Sufficient
1590	6018	Body		8	31	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1591	6018	Body		11	41	geometric	Exterior & Interior	2.5yr 7/6	Pale Yellow	Insufficient
1593	6018	Rim	330	8	25	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1594	6018	Body		10	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1595	6018	Rim	_	12	40	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1596	6018	Body		11	67	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1597	6018	Body		6	40	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Sufficient
1598	6018	Body		13	100	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1599	6018	Body		8	56	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1600	6018	Body		8	33	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1601	6018	Rim	_	8	20	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1603	6018	Body		10	63	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1604	6018	Rim	_	6	50	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1605	6018	Body		8	54	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1606	6018	Body		9	34	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1607	6018	Rim	_	8	40	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1608	6018	Body		9	56	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1610	6018	Rim	390	14	89	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1611	6018	Body		12	70	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1612	6018	Body		8	41	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1613	6018	Body		9	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1614	6018	Body		9	21	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1615	6018	Body		8	44	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1616	6018	Body		13	75	geometric	Exterior & Interior	2.5yr 7/4	Pale Yellow	Insufficient
1617	6018	Body		12	46	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1618	6018	Body		9	37	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Sufficient
1619	6018	Body		7	40	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1620	6018	Body		8	23	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1621	6018	Body		9	52	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Sufficient
1622	6018	Body		10	65	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Sufficient
1623	6018	Body		8	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1624	6018	Body		8	32	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1625	6018	Rim	_	8	28	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient

1626	6018	Body		7	25	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1627	6018	Body		8	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1628	6018	Body		7	33	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1632	6019	Body		21	42	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1633	6019	Rim		14	25	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1634	6019	Rim	_	10	40	geometric	Exterior & Interior	10yr 8/4	Very Pale Brown	Insufficient
1635	6019	Rim	_	12	40	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1636	6019	Rim	_	13	25	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1637	6019	Rim	40	11	25	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1638	6019	Rim	_	6	23	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1639	6019	Body		7	16	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1640	6019	Rim	_	16	35	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1641	6019	Body		8	37	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1642	6019	Rim	_	12	20	_		10yr 8/3	Very Pale Brown	Insufficient
1643	6019	Rim	_	6	20	_		2.5Y 8/3	Pale Yellow	Insufficient
1644	6019	Rim	_	9	36	_		10yr 8/2	Very Pale Brown	Insufficient
1646	6020	Body		8	48	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1447	6020	Rim	_	15	39	_		2.5Y 8/3	Pale Yellow	Insufficient
1648	6020	Body		11	61	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1650	6021	Base	_	18	40	_		10yr 8/3	Very Pale Brown	Insufficient
1651	6021	Body		9	40	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1652	6021	Body		9	38	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1653	6021	Rim	_	13	21	_		2.5Y 8/3	Pale Yellow	Insufficient
1654	6021	Body		8	25	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1655	6021	Body		8	22	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1656	6021	Body		9	39	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1657	6021	Body		8	31	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1658	6021	Rim	_	7	21	_		2.5Y 8/3	Pale Yellow	Insufficient
1659	6021	Body		9	35	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1660	6021	Body		9	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1661	6021	Body		9	38	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1662	6021	Rim	_	13	30	_		2.5Y 8/4	Pale Yellow	Insufficient
1663	6021	Body		8	29	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1664	6021	Base	_	13	46	_		2.5Y 8/3	Pale Yellow	Insufficient
1665	6021	Body		8	27	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1674	6015	Body		6	39	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1676	6015	Rim	350	17	85	_		10yr 7/3	Very Pale Brown	Insufficient
1677	6015	Rim	_	9	40	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1678	6015	Body		8	34	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1679	6015	Rim	_	17	65	_		10yr 8/3	Very Pale Brown	Insufficient
1681	6015	Base	280	21	28	_		10yr 7/6	yellow	Insufficient

1682	6015	Body		8	29	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1683	6015	Body		8	43	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1684	6015	Rim	250	7	65	geometric	Exterior & Interior	5yr 5/6	Yellowish Red	Insufficient
1685	6015	Rim		12	35	_		10yr 7/4	Very Pale Brown	Insufficient
1686	6015	Body		13	48	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1687	6015	Base	180	25	45	_		10yr 7/3	Very Pale Brown	Insufficient
1688	6015	Rim	340	13	71	_		10yr 7/4	Very Pale Brown	Insufficient
1689	6015	Body		13	36	geometric	Exterior & Interior	5yr 8/4	pink	Insufficient
1690	6015	Body								
1691	6015	Base	180	16	40	_		10yr 7/3	Very Pale Brown	Insufficient
1692	6015	Rim	_	13	50	_		10yr 8/3	Very Pale Brown	Insufficient
1693	6015	Rim	_	13	50	_		2.5Y 8/4	Pale Yellow	Insufficient
1694	6015	Rim	_	13	30	_		10yr 7/4	Very Pale Brown	Insufficient
1695	6015	Rim	320	12	45	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1696	6015	Rim		17	30	_		2.5Y 8/2	Pale Yellow	Insufficient
1697	6015	Rim		13	35	_		10yr 7/3	Very Pale Brown	Insufficient
1698	6015	Body		17	62	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1699	6015	Rim		13	35	_		10yr 7/4	Very Pale Brown	sufficient
1700	6015	Rim		12	31	_		2.5Y 8/3	Pale Yellow	sufficient
1701	6015	Body		17	64	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1702	6015	Rim		11	45	_		2.5Y 8/3	Pale Yellow	Insufficient
1703	6015	Rim		16	51	_		7.5yr 7/3	pink	Insufficient
1704	6015	Rim	250	16	84	geometric	Exterior & Interior	10yr 8/2	Pale Yellow	Insufficient
1705	6015	Body		15	51	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1706	6015	Body		7	19	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1708	6015	Rim	330	17	80	_		7.5yr 7/3	pink	Insufficient
1709	6015	Rim		12	25	_		2.5Y 8/3	Pale Yellow	Insufficient
1710	6015	Body		6	23	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1811	6015	Rim		7	21	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1812	6015	Rim		11	50	_		10yr 8/4	Very Pale Brown	Insufficient
1813	6015	Rim		13	45	_		2.5Y 8/3	Pale Yellow	Insufficient
1814	6015	Rim		13	29	_		2.5Y 8/3	Pale Yellow	Insufficient
1815	6015	Rim		12	30	_		10yr 7/3	Very Pale Brown	Insufficient
1816	6015	Rim	350	14	40	_		10yr 8/3	Very Pale Brown	Insufficient
1818	6015	Rim		9	24	_		10YR 7/4	Very Pale Brown	Insufficient
1819	6015	Rim		12	30	_		2.5Y 8/2	Pale Yellow	Insufficient
1820	6015	Rim		13	20	_		2.5Y 8/3	Pale Yellow	sufficient
1821	6015	Rim		13	35	_		2.5YR 8/3	pink	Insufficient
1822	6015	Body		6	29	geometric	Exterior & Interior	2.5YR 5/6	pink	Insufficient
1823	6015	Body		5	40	geometric	Exterior & Interior	2.5YR 5/6	pink	Insufficient
1824	6015	Body		6	32	geometric	Exterior & Interior	2.5YR 8/3	Very Pale Brown	Insufficient

1825	6015	Rim		12	20	_		10YR 8/3	Pale Yellow	Insufficient
1826	6015	Rim		15	55	_		10YR 7/4	Very Pale Brown	Insufficient
1827	6015	Rim		13	35	_		2.5Y 8/3	Pale Yellow	sufficient
1828	6015	Body		6	33	geometric	Exterior & Interior	2.5YR 8/2	Pale Yellow	Insufficient
1829	6015	Rim		7	20	_		10YR 7/4	Very Pale Brown	Insufficient
1830	6015	Rim		8	30	_		7.5YR 6/3	light brown	Insufficient
1831	6015	Rim		8	20	_		2.5Y 8/3	Pale Yellow	Insufficient
1832	6015	Rim	150	15	28	_		10YR 7/3	Very Pale Brown	Insufficient
1833	6015	Rim		8	18	_		7.5YR 6/3	light brown	Insufficient
1850	6021	Body		8	49	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	sufficient
1849	6021	Body		9	31	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	sufficient
1846	6021	Rim	200	10	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1852	6021	Body		9	34	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1854	6021	Body		9	17	geometric		2.5yr 7/3	Pale Yellow	Insufficient
1848	6021	Rim		7	25	_		2.5Y 8/2	Pale Yellow	sufficient
1845	6021	Rim		5	40	_		2.5Y 7/3	Pale Yellow	Insufficient
1844	6021	Base	110	13	35	_		7.5YR 6/3	light brown	Insufficient
1896	6029	Body		6	55	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	sufficient
1900	6029	Rim	90	7	40	geometric	Exterior & Interior	10yr 7/2	light brown	Insufficient
1894	6029	Body		7	38	geometric	Exterior & Interior	10yr 7/2	light brown	Insufficient
1892	6029	Rim		12	60	_		10yr 7/2	light brown	Insufficient
1890	6029	Rim	160	16	25	_		10yr 7/3	Pale Brown	Insufficient
1893	6029	Base	170	13	30	_		10yr 7/2	light brown	Insufficient
1891	6029	Rim		18	43	_		10yr 7/3	Pale Brown	Insufficient
1897	6029	Body		9	55	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1901	6029	Body		12	53	geometric	Exterior & Interior	5yr 7/4	PInk	Insufficient
1899	6029	Body		11	25	geometric	Exterior & Interior	10yr 8/2	Very Pale Brown	Insufficient
1898	6029	Body		9	40	geometric	Exterior & Interior	10yr 7/3	Pale Brown	Insufficient
1738	6018	Body		8	40	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1743	6018	Rim		10	41	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1744	6018	Rim	160	8	32	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1742	6018	Body		6	36	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1746	6018	Rim		7	28	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1745	6018	Rim	200	10	33	geometric	Exterior & Interior	2.5yr 7/4	Pale Yellow	Insufficient
1732	6018	Body		9	43	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1733	6018	Body		9	37	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1735	6018	Body		11	52	geometric	Exterior & Interior	10yr 6/2	Brownish gray	Insufficient
1736	6018	Body		12	32	geometric	Exterior & Interior	10yr 7/3	Pale Brown	Insufficient
1731	6018	Body		10	33	geometric	Exterior & Interior	10yr 7/3	Pale Brown	Insufficient
1737	6018	Body		9	15	geometric	Exterior & Interior	10yr 8/3	Pale Yellow	Insufficient
1729	6018	Rim		9	40	geometric	Exterior & Interior	10yr 8/3	Pale Yellow	Insufficient

1730	6018	Body		13	35	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1739	6018	Rim		8	27	geometric	Exterior & Interior	2.5yr 8/4	Pale Yellow	Insufficient
1728	6018	Rim		12	29	_		2.5Y 8/4	Pale Yellow	Insufficient
1734	6018	Body		9	35	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1747	6018	Rim		6	28	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1740	6018	Body		7	25	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1909	6031	Base		13	15	_		10yr 7/3	Pale Brown	Insufficient
1922	6031	Rim	60	7	60	_		10yr 5/1	Gray	sufficient
1915	6031	Body		11	33	geometric	Exterior & Interior	10yr 7/3	Pale Brown	Insufficient
1921	6031	Body		12	55	_		10yr 5/1	Gray	Insufficient
1914	6031	Body		8	29	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1905	6031	Rim	150	12	50	_		10yr 7/3	Very Pale Brown	sufficient
1917	6031	Body		11	18	geometric	Exterior & Interior	10yr 7/3	pale Brown	Insufficient
1904	6031	Rim		16	45	_		10yr 7/4	pale Brown	Insufficient
1908	6031	Base		25	30	_		10yr 7/3	pale Brown	Insufficient
1907	6031	Rim	170	10	40	_		10yr 8/3	pale Brown	Insufficient
1920	6031	Body		10	38	with on Buff	Exterior & Interior	10yr 8/3	pale Brown	Insufficient
1916	6031	Body		12	33	_		10yr 7/3	pale Brown	Insufficient
1875	6026	Rim		17	42	_		10yr 7/3	Very Pale Brown	Insufficient
1425	6017	Body		9	45	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1341	6013	Rim		7	21	_		2.5Y 7/4	Pale Yellow	Insufficient
1340	6013	Rim		10	27	_		10yr 7/4	Very Pale Brown	Insufficient
1338	6013	Rim		6	26	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1339	6013	Rim	130	10	45	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1847	6021	Body		8	34	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	sufficient
1853	6021	Rim		9	42	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	sufficient
1851	6021	Rim		8	21	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	sufficient
1302	6004	Body		9	32	geometric	Exterior & Interior	7.5yr 7/4	pink	sufficient
1301	6004	Rim		10	30	_		7.5yr 7/4	pink	Insufficient
1858	6028	Rim	180	13	61	_		2.5Y 8/2	Pale Yellow	Insufficient
1867	6028	Rim	110	8	30	geometric	Exterior & Interior	10yr 8/2	Very Pale Brown	sufficient
1865	6028	Body		9	50	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1863	6028	Body		7	42	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1864	6028	Rim		9	33	_		10yr 7/3	Pale Yellow	Insufficient
1859	6028	Rim		13	40	_		2.5Y 8/3	Pale Yellow	sufficient
1861	6028	Rim		15	45	_		10yr 8/2	Pale Yellow	Insufficient
1860	6028	Rim		14	45	_		2.5Y 8/3	Pale Yellow	Insufficient
1862	6028	Rim		12	44	_		2.5Y 7/3	Pale Yellow	sufficient
1868	6028	handle		34	40	_		2.5Y 8/3	Pale Yellow	Insufficient
1918	6031	Rim	110	10	41	geometric	Exterior & Interior	10yr 7/3	Pale Yellow	Insufficient
1903	6031	Rim	350	13	35	_		2.5Y 8/3	Pale Yellow	sufficient

1902	6031	Rim		13	115	_		10yr 7/3	Pale Brown	Insufficient
1910	6031	Rim	90	9	65	_		2.5yr 5/4	Reddish Brown	Insufficient
1919	6031	Rim	70	13	35	geometric	Exterior & Interior	10yr 8/2	Pale Brown	sufficient
1911	6031	Body		10	29	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1913	6031	Body		12	53	geometric	Exterior & Interior	10yr 7/3	Pale Brown	Insufficient
1912	6031	Body		7	36	geometric	Exterior & Interior	10yr 7/2	Gray	Insufficient
1906	6031	Rim		7	40	_		10yr 7/3	Pale Brown	sufficient
1886	6028	Rim		10	60	geometric	Exterior & Interior	10yr 7/3	Pale Brown	sufficient
1884	6028	Base		15	35	_		10yr 7/3	Pale Brown	Insufficient
1881	6028	Rim		14	80	_		2.5Y 8/2	Pale Yellow	Insufficient
1887	6028	Body		7	37	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1882	6028	Rim		17	22	_		10yr 7/3	Pale Brown	Insufficient
1883	6028	Rim		13	44	_		2.5Y 8/2	Pale Yellow	Insufficient
1718	6022	Base	90	15	35	_		10yr 7/3	Very Pale Brown	Insufficient
1334	6012	Rim		12	75	_		10yr 7/3	Pale Brown	Insufficient
1144	6005	Body		8	42	geometric	Inside	10yr 7/3	Very Pale Brown	Insufficient
1151	6005	Body		10	54	geometric	Outside	10yr 7/3	Very Pale Brown	Insufficient
1152	6005	Body		17	65	geometric	Exterior & Interior	10yr 7/3	Very Pale Brown	Insufficient
1149	6005	Body		8	25	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	sufficient
1150	6005	Body		9	24	geometric	Exterior & Interior	10yr 8/2	Very Pale Brown	Insufficient
1145	6005	Body		12	47	geometric	Exterior & Interior	10yr 8/3	Very Pale Brown	Insufficient
1147	6005	Rim		9	40	geometric	Exterior & Interior	5yr 5/4	Reddish Brown	Insufficient
1153	6005	Body		8	14	geometric	Exterior & Interior	10yr 8/2	Very Pale Brown	sufficient
1139	6005	Rim	210	20	70	_		2.5Y 8/3	Pale Yellow	Insufficient
1143	6005	Rim		11	25	_		10yr 7/3	Very Pale Brown	Insufficient
1138	6005	Rim	180	13	55	_		2.5Y 8/2	Pale Yellow	Insufficient
1140	6005	Rim	210	16	28	_		10yr 8/2	Very Pale Brown	Insufficient
1141	6005	Rim		8	41	_		10yr 8/2	Very Pale Brown	Insufficient
1142	6005	Rim		10	21	_		10yr 7/1	light gray	Insufficient
1148	6005	Base		20	30	_		2.5Y 7/3	Pale Yellow	Insufficient
1873	6023	Body		7	31	geometric	Exterior & Interior	10yr 8/3	Pale Brown	Insufficient
1872	6023	Rim		11	45	geometric	Exterior & Interior	10yr 6/3	Pale Brown	Insufficient
1874	6023	Body		8	18	geometric	Exterior & Interior	2.5yr 7/4	Pale Yellow	Insufficient
1712	6014	Rim		8	57	_		7.5YR 7/4	pink	Insufficient
1711	6014	Rim		14	34	_		10yr 7/4	Very Pale Brown	Insufficient
1722	6021	Rim	290	17	64	_		2.5Y 8/3	Pale Yellow	Insufficient
1727	6021	Rim	170	8	66	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1724	6021	Body		8	45	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1626	6021	Rim		8	30	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1725	6021	Body		9	38	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1721	6021	Rim	190	15	55	_		10yr 7/3	Pale Brown	Insufficient

1720	6021	Body	250	9	40	_		10yr 8/3	Pale Brown	Insufficient
1723	6021	Body		9	35	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
1719	6021	Base	130	7	35	_		7.5YR 6/3	Light brown	Insufficient
1842	6014	Rim		5	16	geometric	Exterior & Interior	10yr 8/3	Pale Brown	Insufficient
1843	6014	Rim		6	16	geometric	Exterior & Interior	10yr 8/3	Pale Brown	Insufficient
1841	6014	Rim		8	17	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	Insufficient
1287	6016	Body		27	114	_		10yr 7/4	Very Pale Brown	Insufficient
1532	6016	Rim		11	200	geometric	Exterior & Interior	10yr 7/4	Very Pale Brown	Insufficient
1866	6028	Body		7	22	geometric	Exterior & Interior	2.5yr 8*3	Pale Yellow	Insufficient
1952	6032	Rim		11	38	geometric	Exterior & Interior	10yr 7/3	Pale Brown	sufficient
1954	6032	Rim		6	21	geometric	Exterior & Interior	2.5yr 8/3	Pale Yellow	sufficient
1951	6032	Body		16	40	_		10yr 7/4	Pale Brown	Insufficient
1953	6032	Rim		10	25	geometric	Exterior & Interior	10yr 7/4	Pale Brown	Insufficient
1949	6032	Rim		12	24	_		10yr 7/3	Pale Brown	Insufficient
1950	6032	Rim		13	30	_		10yr 4/1	dark gray	Insufficient
1956	6032	Body	100	6	33	_		10yr 4/1	dark gray	Insufficient
1955	6032	Rim		7	46	_		7.5yr 4/4	Pale Brown	Insufficient
1983	6034	Body		9	33	_		10yr 4/1	dark gray	Insufficient
1985	6034	Base		8	12	_		10yr 6/3	Pale Brown	Insufficient
1980	6034	Body		5	40	_		10yr 4/1	dark gray	Insufficient
1984	6034	Rim		10	28	_		10yr 5/1	Gray	Insufficient
1981	6034	Rim		9	28	_		10yr 6/3	Gray	Insufficient
1982	6034	Rim		6	34	_		10yr 5/1	Gray	Insufficient
1977	6034	Rim		9	47	_		10yr 6/3	Pale Brown	Insufficient
1979	6034	Rim		4	14	_		10yr 7/3	Pale Brown	Insufficient
1978	6034	Rim		12	38	_		10yr 6/3	Pale Brown	Insufficient
1976	6034	Rim	190	11	60	geometric	Exterior & Interior	10yr 6/3	Pale Brown	Insufficient
1931	6033	Rim		13	45	geometric	Exterior & Interior	2.5yr 8/2	Pale Yellow	Insufficient
1929	6033	Body		5	39	geometric	Exterior & Interior	7.5yr 7/4	pink	Insufficient
1932	6033	Body		8	24	geometric	Exterior & Interior	2.5yr 7/3	Pale Yellow	Insufficient
1933	6033	Rim		8	45	_		2.5yr 4/3	Reddish Brown	Insufficient
1935	6033	Body		12	47	_		10yr 4/2	dark gray	Insufficient
1934	6033	Body		5	18	_		10yr 3/1	dark gray	Insufficient
1928	6033	Rim		8	45	geometric	Exterior & Interior	10yr 7/4	Pale Brown	Insufficient
1930	6033	Rim		7	26	geometric	Exterior & Interior	7.5yr 6/3	light brown	Insufficient
1927	6031	Body		6	38	geometric	Exterior & Interior	10yr 7/2	Gray	Insufficient
1946	6031	Body		7	28	geometric	Exterior & Interior	10yr 8/3	Pale Brown	Insufficient
1948	6031	Body		7	33	geometric	Exterior & Interior	10yr 4/1	Gray	Insufficient
1947	6031	Body		5	23	_		5yr 5/1	Gray	Insufficient
1937	6029	Rim		6	22	geometric	Exterior & Interior	7.5yr 7/2	Pinkish Grey	Insufficient
1938	6029	Body		8	35	_		7.5yr 7/2	Gray	Insufficient

1936	6029	Body		6	34	_		7.5yr 6/3	light brown	Insufficient
1943	6030	Base		7	10	geometric	Exterior & Interior	10yr 6/4	yellowish brown	Insufficient
1940	6030	Rim		12	50	_		10yr 7/4	Pale Brown	Insufficient
1942	6030	Rim	170	10	37	_		10yr 8/3	Pale Brown	Insufficient
1939	6030	Rim		11	59	geometric	Exterior & Interior	10yr 6/4	Brownish gray	Insufficient
1945	6030	Body		6	33	_		10yr 6/4	Brownish gray	Insufficient
1944	6030	Body		6	26	_		7.5yr 5/2	Brown	Insufficient
1941	6030	Rim		5	30	_		2.5yr 5/3	Reddish Brown	Insufficient
1924	6030	Rim		10	46	_		10yr 8/2	Pale Yellow	Insufficient
1923	6030	Rim		8	34	_		10yr 6/4	yellowish brown	Insufficient
1926	6030	Body		8	44	_		10yr 5/1	Gray	Insufficient
1925	6030	Body		7	40	_		10yr 5/1	Gray	Insufficient
1961	6033	Rim	290	16	62	_		10yr 6/4	yellowish brown	Insufficient
1958	6033	Rim		21	70	_		10yr 6/3	Pale Brown	Insufficient
1959	6033	Rim		7	38	_		10yr 7/4	Pale Brown	Insufficient
1964	6033	Rim		15	38	_		10yr 7/3	Pale Brown	Insufficient
1957	6033	Rim		12	52	_		10yr 7/3	Pale Brown	Insufficient
1963	6033	Rim		12	43	_		10yr 7/3	Pale Brown	Insufficient
1962	6033	Rim		9	50	_		10yr 7/3	Pale Brown	Insufficient
1965	6033	Rim		12	35	_		2.5Y 8/3	Pale Yellow	Insufficient
1967	6033	Rim		11	52	geometric	inside	10yr 7/4	Pale Brown	Insufficient
1966	6033	Rim	140	9	38	_		7.5yr 6/4	light brown	Insufficient
1972	6033	Body		7	32	_		7.5yr 5.2	brown	Insufficient
1969	6033	Rim	90	6	23	_		10yr 5/1	Gray	Insufficient
1974	6033	Body		6	34	_		7.5yr 5/2	brown	Insufficient
1971	6033	Rim		7	38	_		10yr 4/1	dark gray	Insufficient
1975	6033	Body		7	24	_		10yr 4/1	dark gray	Insufficient
1973	6033	Body		7	38	_		7.5yr 4/1	dark gray	Insufficient
1970	6033	Rim		4	14	_		7.5yr 4/1	dark gray	Insufficient
1968	6033	Rim	70	8	30	_		7.5yr 4/1	dark gray	Insufficient
1960	6033	Rim		6	36	_		10yr 7/3	Very Pale Brown	sufficient
1529	6017	Rim	210	7	55	geometric	inside	2.5yr 4/4	red	sufficient
2015	6036	Rim	170	10	35	geometric	inside	10yr 7/4	Very Pale Brown	Insufficient
2002	6036	Rim	290	9	25	_		5yr 8/3	Pale Yellow	Insufficient
2009	6036	Base	200	13	45	_		10yr 8/3	Very Pale Brown	Insufficient
2003	6036	Rim		16	30	_		10yr 8/3	Very Pale Brown	Insufficient
2007	6036	Rim		21	50	_		2.5Y 8/2	Pale Yellow	Insufficient
2013	6036	Rim	80	7	25	_		2.5Y 7/3	Pale Yellow	Insufficient
2004	6036	Rim	140	8	20	_		2.5Y 8/3	Pale Yellow	Insufficient
2011	6036	Rim		6	16	_		2.5Y 8/3	Pale Yellow	sufficient

2010	6036	Rim	270	12	40	_		10yr 6/2	dark grayish brown	Insufficient
2008	6036	Base	110	11	18	_		2.5Y 8/2	Pale Yellow	Insufficient
2005	6036	Rim		13	50	_		2.5Y 7/3	Pale Yellow	Insufficient
2014	6036	Rim	160	7	26	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2012	6036	Rim		9	17	_		7.5yr 7/3	pink	Insufficient
2006	6036	Rim		7	20	_		2.5Y 8/2	Pale Yellow	Insufficient
2017	6035	Rim	230	11	38	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2016	6035	Rim	180	11	40	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2018	6035	Rim		5	50	_		2.5yr 8/2	Pale Yellow	Insufficient
2020	6035	Body		10	36	geometric	inside	2.5yr 8/2	Pale Yellow	Insufficient
2021	6035	Rim	300	11	65	_		2.5yr 5/6	red	Insufficient
2019	6035	Body		11	37	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2000	6034	Rim	130	7	40	_		2.5Y 8/3	Pale Yellow	Insufficient
1999	6034	Rim	160	14	33	_		10yr 8/3	Very Pale Brown	Insufficient
2001	6034	Rim	140	6	62	_		2.5yr 3/1	Very Pale Brown	Insufficient
1993	6035	Rim	130	10	45	geometric	inside	2.5yr 8/3	Pale Yellow	sufficient
1995	6035	Body		15	54	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
1992	6035	Rim	150	10	25	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
1986	6035	Rim		15	40	_		2.5Y 8/3	Pale Yellow	Insufficient
1994	6035	Rim	150	10	25	geometric	inside	2.5yr 8/3	Pale Yellow	sufficient
1989	6035	Rim		7	27	_		5YR 7/4	pink	Insufficient
1988	6035	Rim		16	48	_		2.5Y 8/3	Pale Yellow	sufficient
1991	6035	Rim	140	12	21	_		2.5Y 7/3	Pale Yellow	Insufficient
1987	6035	Rim	160	10	30	_		2.5Y 8/3	Pale Yellow	sufficient
1990	6035	Rim	100	5	21	_		2.5yr 3/6	Dark red	Insufficient
2033	6034	Rim		11	50	geometric	inside	10yr 7/4	Pale Brown	Insufficient
2039	6036	Body		12	30	geometric	inside	10yr 7/4	Pale Brown	Insufficient
2032	6037	Rim	190	7	50	_		10yr 7/3	Pale Brown	Insufficient
2029	6037	Body		7	44	geometric	inside	10yr 8/3	Pale Brown	Insufficient
2030	6037	Rim	150	7	54	geometric	inside	7.5yr 6/4	light brown	Insufficient
2031	6037	Rim		6	44	_		10yr 8/3	Pale Brown	Insufficient
2037	6035	Rim	190	10	50	_		10yr 6/4	yellowish brown	Insufficient
2036	6035	Rim	110	7	50	_		10yr 6/3	Pale Brown	Insufficient
2034	6035	Rim		11	34	_		10yr 5/3	Brown	Insufficient
2038	6035	Rim	180	7	27	_		10yr 7/4	Pale Brown	Insufficient
2035	6035	Body		6	27	geometric	inside	2.5yr 8/3	pale yellowish brown	Insufficient
2041	6037	Rim	240	13	45	_		5yr 8/4	Pale Yellow	Insufficient
2042	6037	Rim		9	40	geometric	inside	5yr 8/4	Pale Yellow	Insufficient
2043	6037	Rim		9	50	_		2.5Y 8/3	Pale Yellow	Insufficient

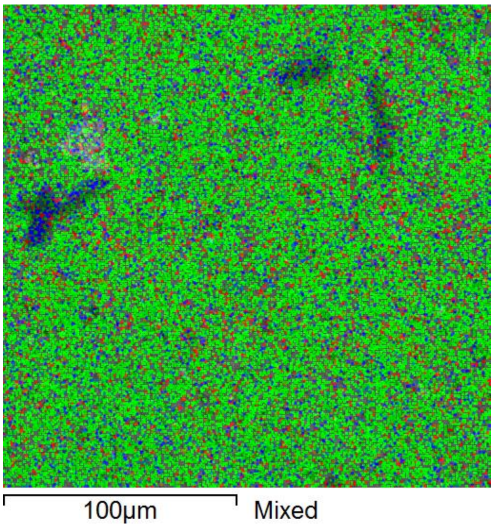
2044	6037	Rim	230	9	50	_		10yr 8/2	Very Pale Brown	Insufficient
2045	6037	Rim	90	5	25	geometric	inside	5yr 6/4	light redish brown	Insufficient
2047	6037	Base	150	13	25	_		2.5Y 7/3	Pale Yellow	Insufficient
2048	6037	Rim		11	68	_		10yr 6/4	light reddish brown	Insufficient
2049	6037	Rim	110	9	35	_		2.5Y 8/3	Pale Yellow	Insufficient
2050	6037	Rim	130	10	44	_		2.5Y 8/3	Pale Yellow	Insufficient
2051	6037	Rim	170	11	30	_		2.5Y 8/3	Pale Yellow	Insufficient
2052	6037	Rim	190	8	50	_		10yr 8/3	Very Pale Brown	Insufficient
2053	6037	Rim		20	50	_		10yr 8/3	Very Pale Brown	Insufficient
2054	6037	Rim		10	47	_		10yr 8/3	Very Pale Brown	Insufficient
2055	6037	Rim		9	45	_		10yr 8/3	Very Pale Brown	Insufficient
2056	6037	Rim		5	34	_		10yr 8/3	Very Pale Brown	Insufficient
2076	6035	Rim		22	70	_		10yr 7/3	Pale Brown	Insufficient
2070	6035	Rim		11	29	_		2.5Y 8/3	Pale Yellow	Insufficient
2073	6035	Rim		10	30	_		10yr 7/3	Pale Brown	Insufficient
2069	6035	Rim	280	11	34	_		7.5yr 7/4	pink	Insufficient
2060	6035	Rim		14	48	_		10yr 7/3	Pale Brown	Insufficient
2062	6035	Rim		9	55	_		2.5Y 7/3	Pale Yellow	Insufficient
2071	6035	Rim		10	45	_		7.5yr 7/4	pink	Insufficient
2072	6035	Rim		5	22	_		10yr 7/3	Pale Brown	Insufficient
2068	6035	Rim		9	35	_		10yr 8/3	Pale Brown	Insufficient
2065	6035	Base	200	12	15	_		10yr 7/3	Pale Brown	Insufficient
2064	6035	Base		8	22	_		10yr 6/4	yellowish brown	Insufficient
2057	6035	Rim	220	12	85	geometric	inside	2.5yr 7/3	Pale Yellow	Insufficient
2067	6035	Body		7	40	geometric	inside	10yr 7/3	Pale Brown	Insufficient
2061	6035	Body		13	50	geometric	inside	10yr 7/3	Pale Brown	Insufficient
2077	6035	Body		10	21	geometric	inside	10yr 7/3	Pale Brown	Insufficient
2059	6035	Body		11	66	geometric	inside	7.5yr 7/4	light brown	Insufficient
2074	6035	Rim		10	57	_		10yr 6/3	Pale Brown	Insufficient
2058	6035	Rim		8	48	geometric	inside	2.5yr 7/3	Pale Yellow	Insufficient
2075	6035	Body		9	21	geometric	inside	10yr 7/3	Pale Brown	Insufficient
2063	6035	Rim		10	77	_		7.5yr 4/2	Brown	Insufficient
2066	6035	Rim	80	6	35	_		7.5yr 4/3	Brown	Insufficient
2080	6036	Rim		10	56	_		10yr v7/2	light gray	Insufficient
2079	6036	Body		8	37	geometric	inside	10yr 7/3	Very Pale Brown	Insufficient
2078	6036	Body		8	20	_		10yr 7/3	Very Pale Brown	Insufficient
2085	6040	Rim		10	25	_		10yr 7/4	Very Pale Brown	Insufficient
2086	6042	Rim		11	54	_		2.5yr 6/6	light red	Insufficient
2087	6042	Rim	110	10	25	_		10yr 7/5	Yellow	Insufficient
2088	6042	Rim	190	20	44	_		7.5YR 6/3	light brown	Insufficient

2089	6042	Rim	110	7	40	_		7.5yr 4/1	dark gray	Insufficient
2090	6042	Rim	120	12	22	_		10yr 8/5	Yellow	Insufficient
2091	6042	Base		20	45	_		7.5yr 7/5	reddish yellow	Insufficient
2081	6041	Rim		10	44	_		7.5YR 6/6	reddish yellow	Insufficient
2082	6041	Rim	110	11	30	_		10yr 8/4	Very Pale Brown	Insufficient
2083	6041	Rim	100	9	30	_		10yr 8/4	Very Pale Brown	Insufficient
2084	6041	Base	160	18	25	_		10yr 8/5	Yellow	Insufficient
2094	6041	Rim		8	20	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2095	6037	Rim		9	25	_		2.5Y 7/3	Pale Yellow	Insufficient
2096	6037	Rim	110	6	50	_		2.5Y 8/3	Pale Yellow	Insufficient
2097	6028	Rim		5	13	geometric	inside	10yr 4/5	veak red	Insufficient
2098	6028	Body		9	12	geometric	inside	10yr 7/3	Very Pale Brown	Insufficient
2099	6028	Body		11	34	geometric	inside	2.5yr 8/3	Pale Yellow	Insufficient
2101	6042	Rim		5	29	_		5YR 8/1	Very Pale Brown	Insufficient

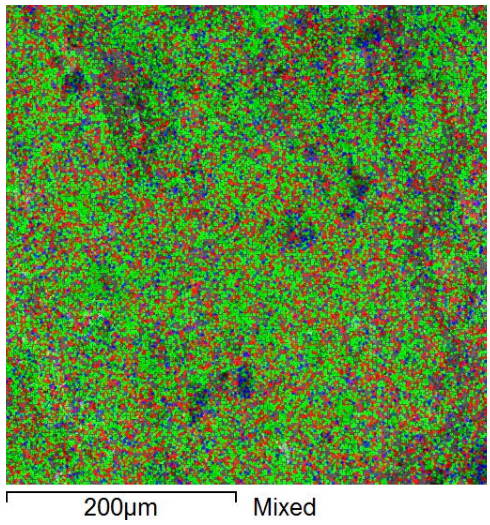
Appendix C

SEM microstructure of the samples

Ebrahimabad

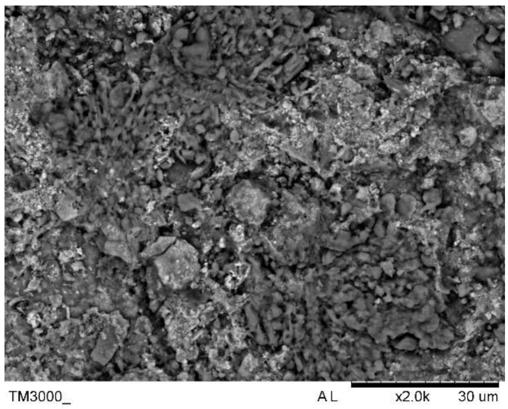


Sample E2e

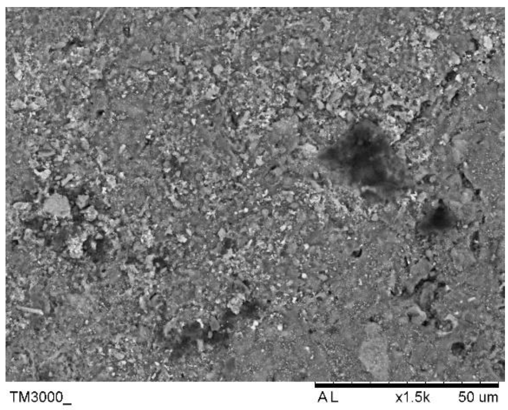


Sample E2O

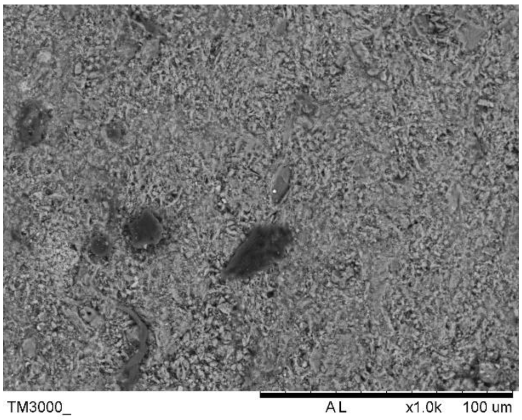
Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue) [with image]



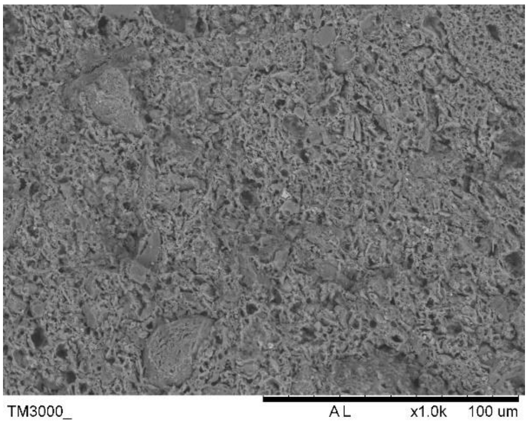
Sample E2c



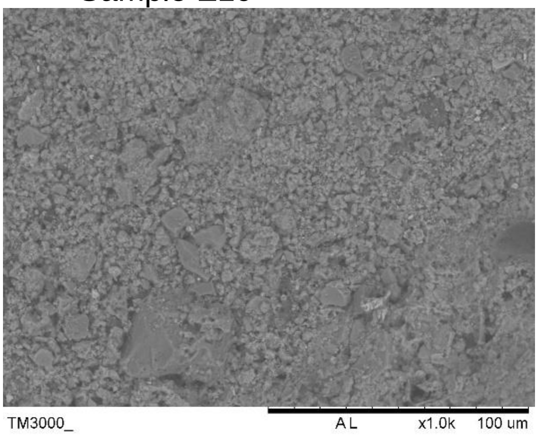
Sample E2d



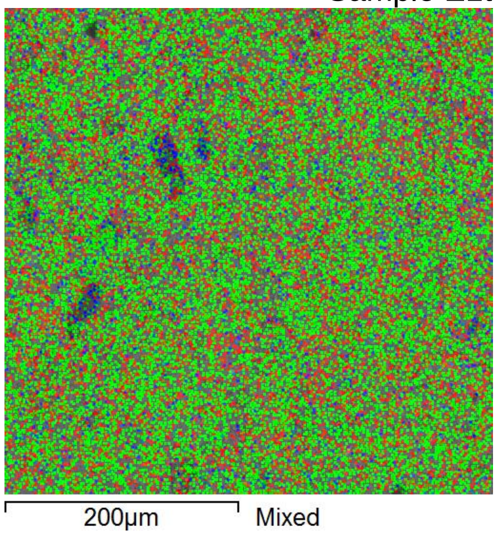
Sample E1c



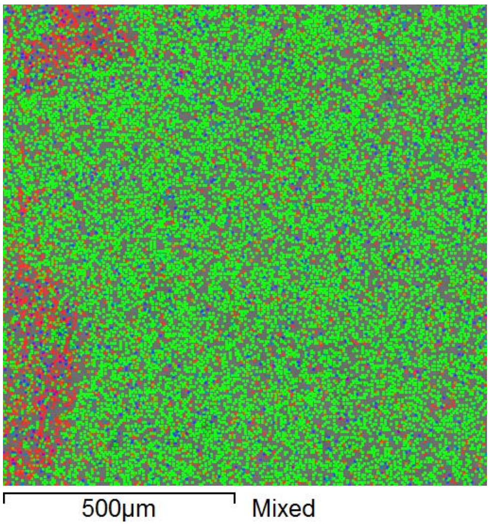
Sample E1t



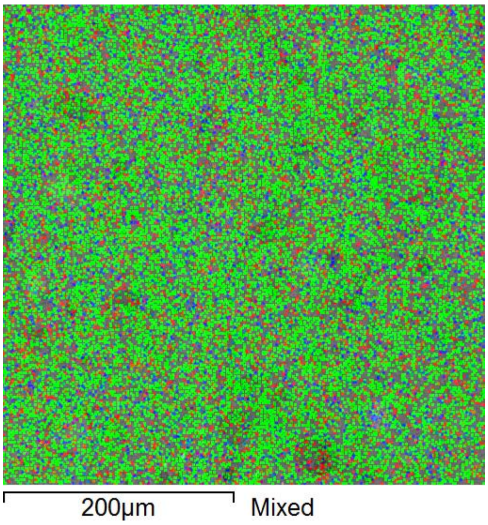
Sample E2O



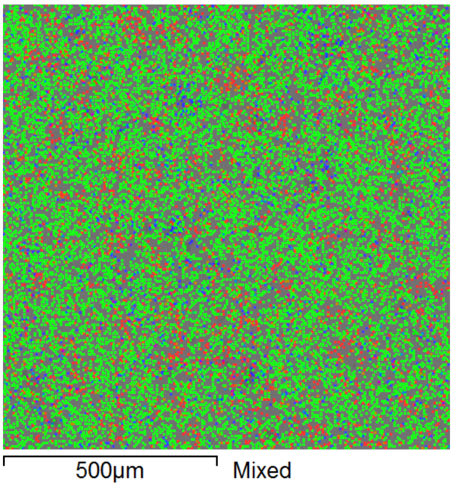
Sample E1p Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



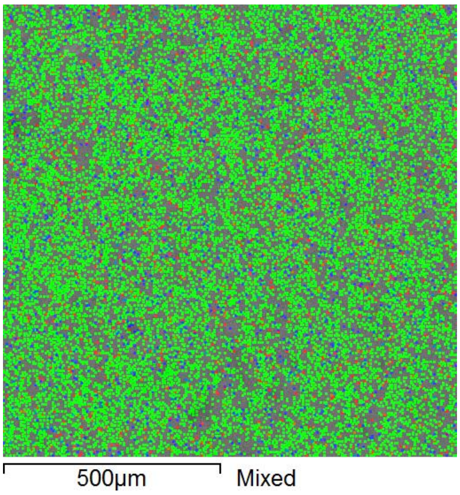
Sample P2b Mixed map: Calcium Ka1(red), Silicon Ka1(green), Iron Ka1_2(blue)



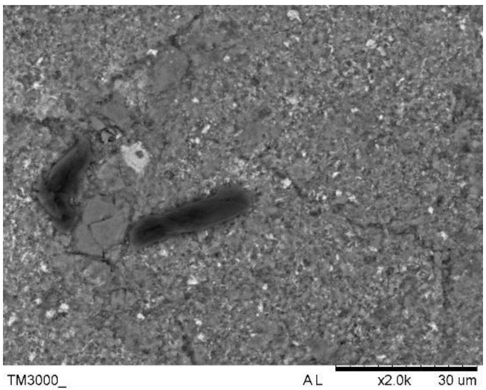
Sample P2a Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



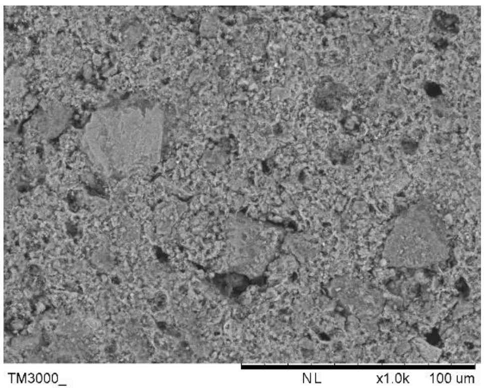
Sample P2g Mixed map: Calcium Ka1(red), Silicon Ka1(green), Iron Ka1(blue)



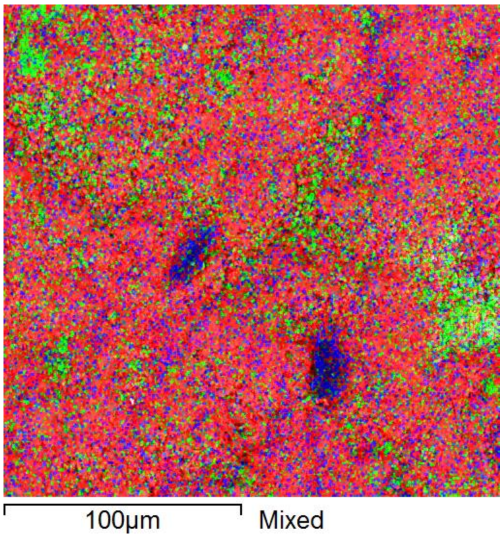
Sample P2c Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



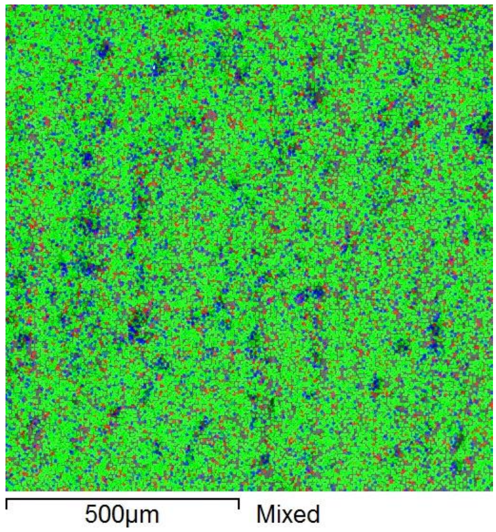
Sample P2g



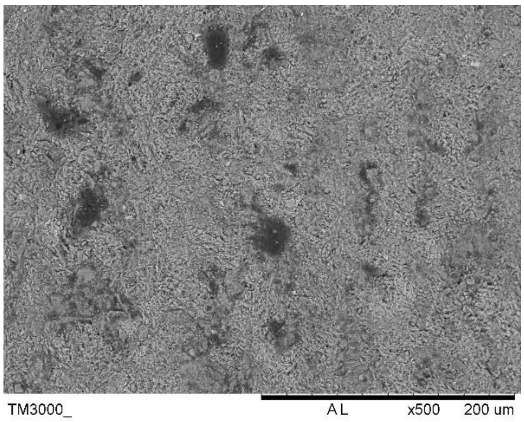
Sample P1b



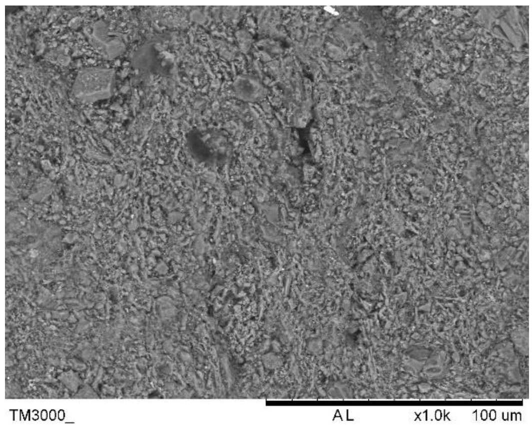
Sample S2n, red pigment,
Mixed map: iron Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



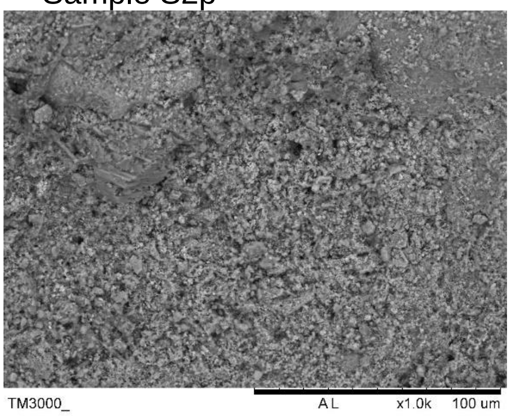
Sample S2p Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



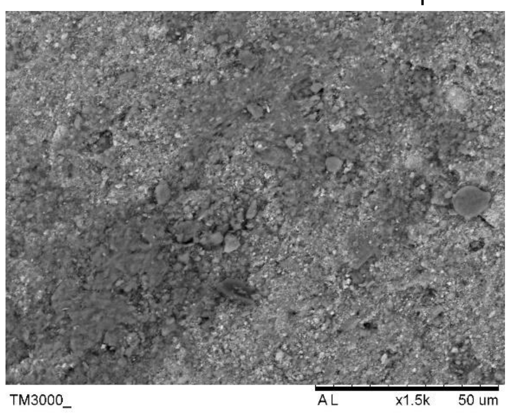
Sample S2p



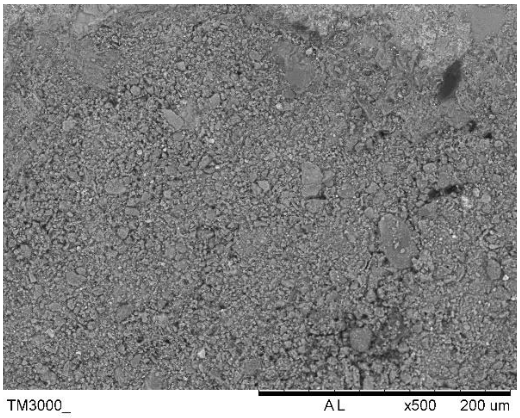
Sample S2d

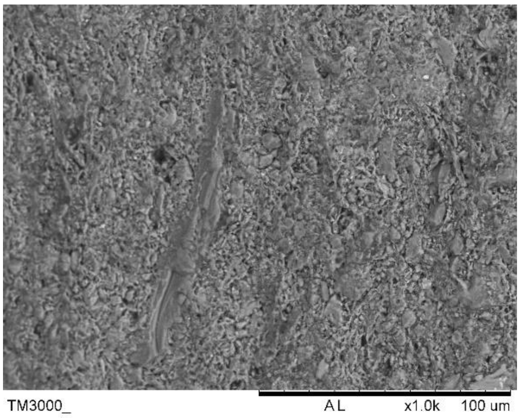


Sample S2n



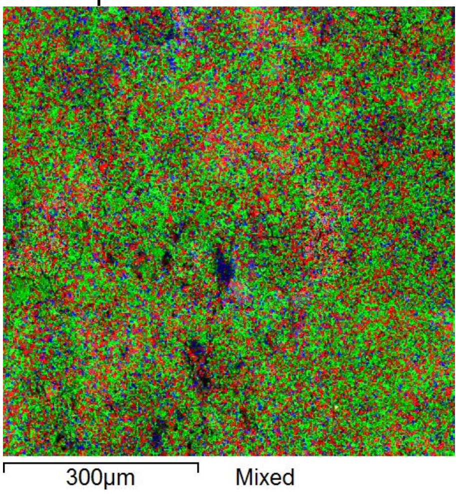
Sample S2m

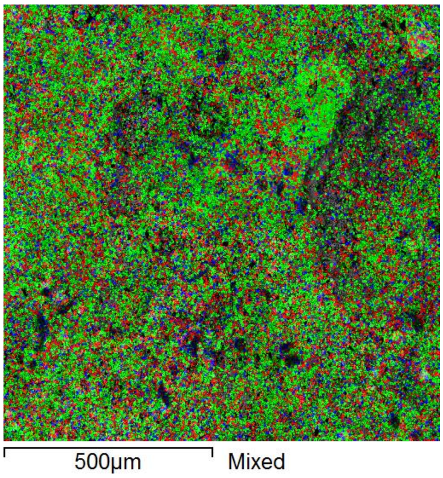




Sample S2k

Sample S2b

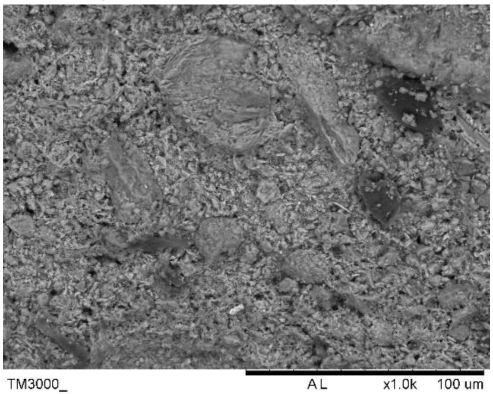


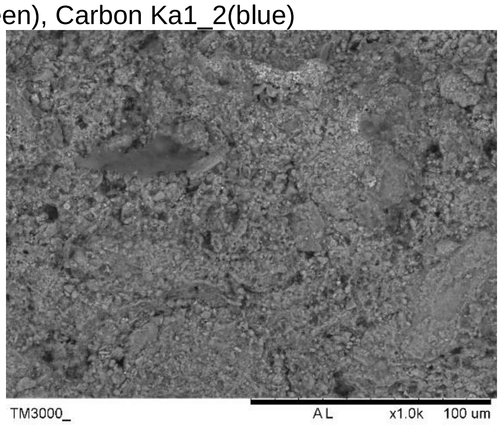


Sample S1ac

Sample S1ae

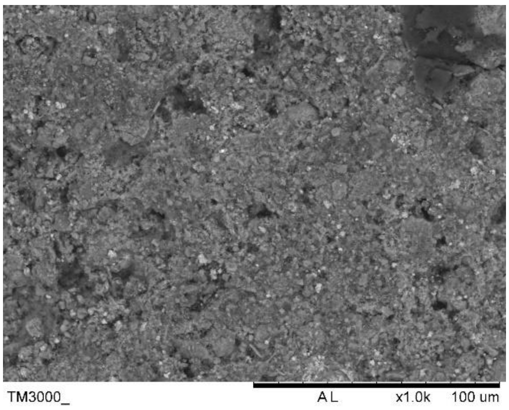
Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)

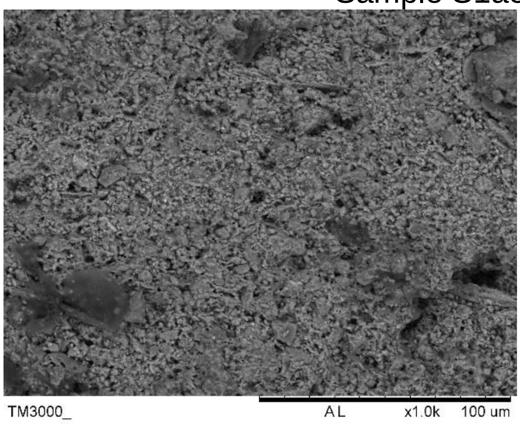




Sample S1ac

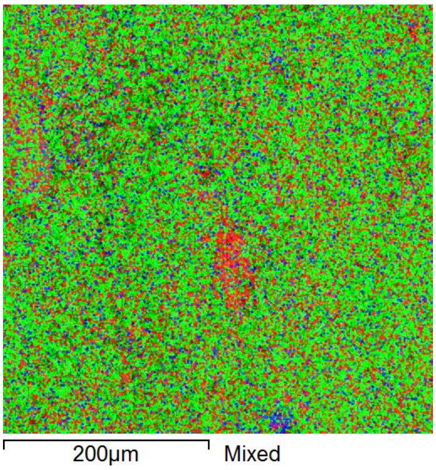
Sample S1ae

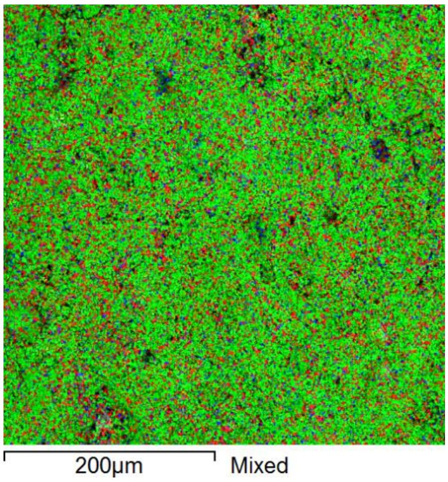




Sample S1f

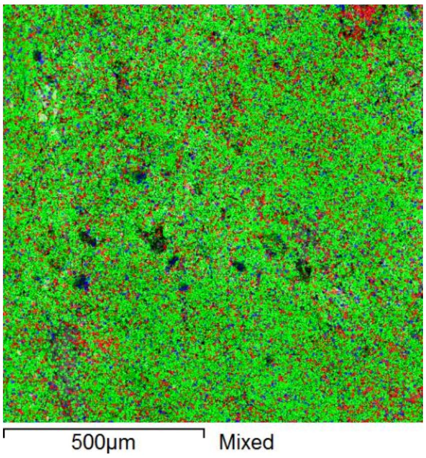
Sample S1c

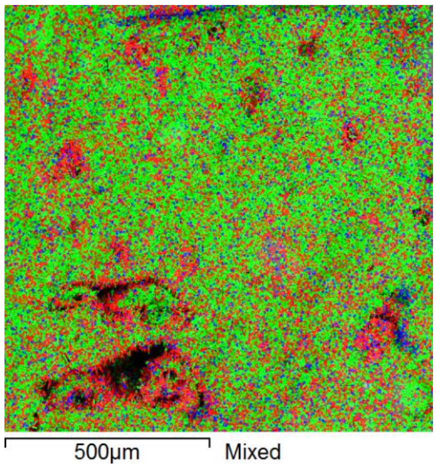




Sample S1c S1i

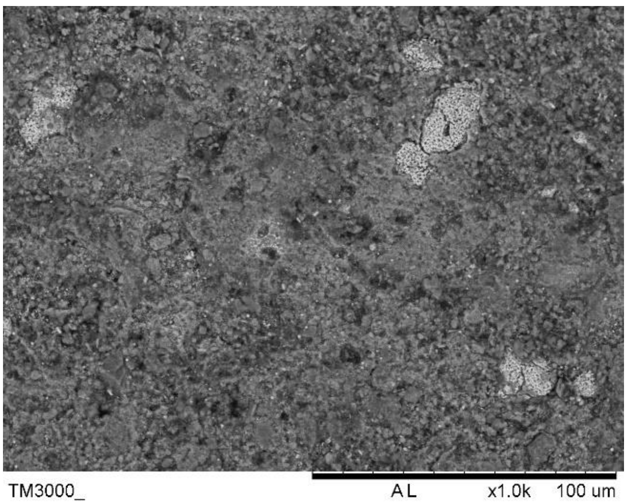
Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)

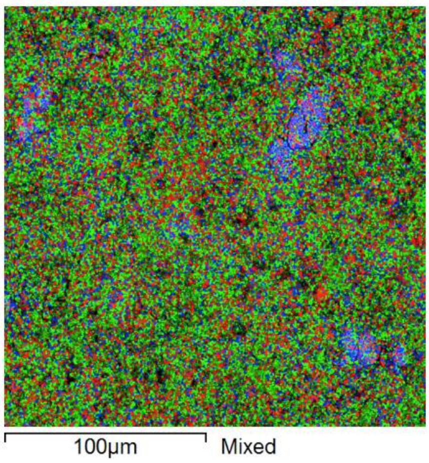




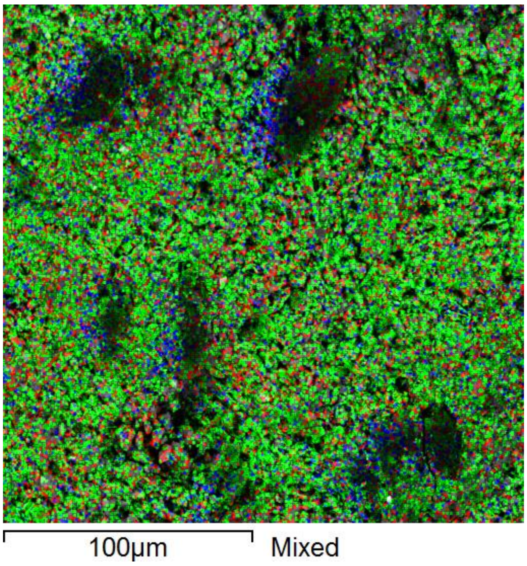
Sample S1q Sample S1f

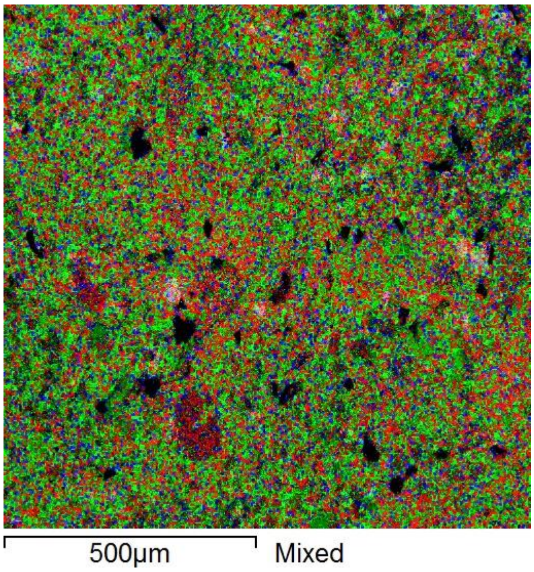
Mixed map:Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



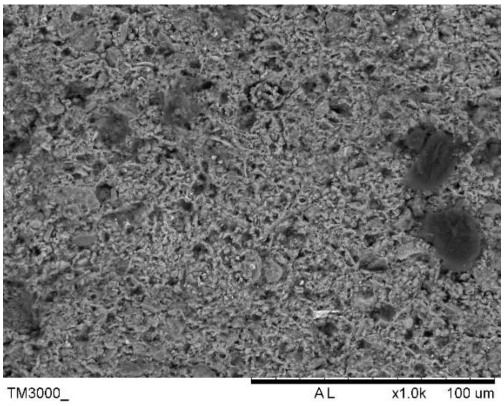


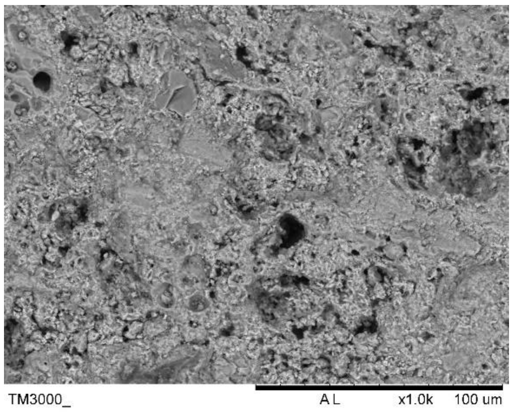
Sample S1t, Mixed map: Calcium Ka1(red), Silicon Ka1(green), Iron Ka1_2(blue)



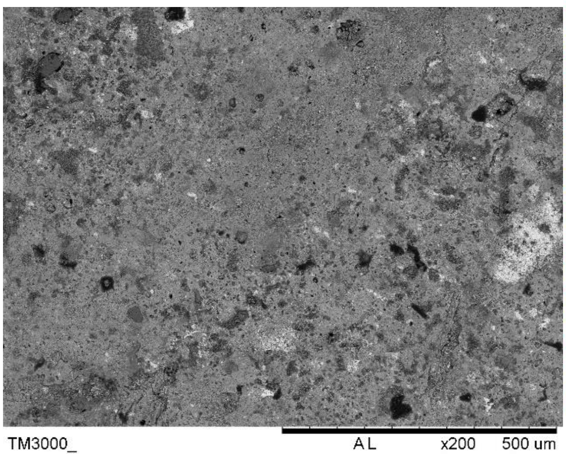


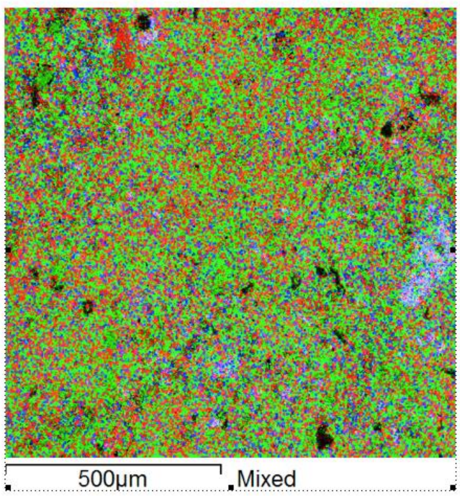
Sample S1v S1ad
Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



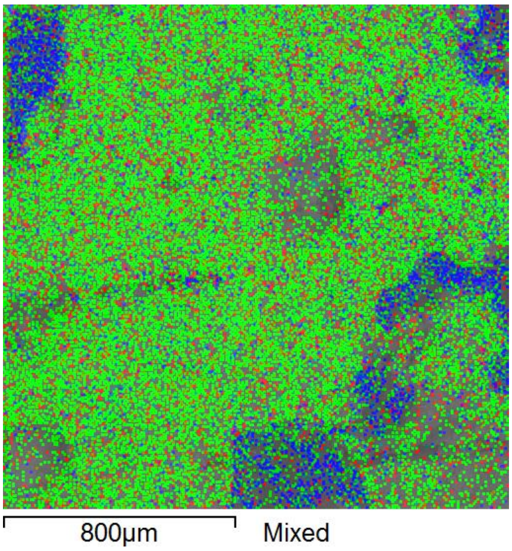


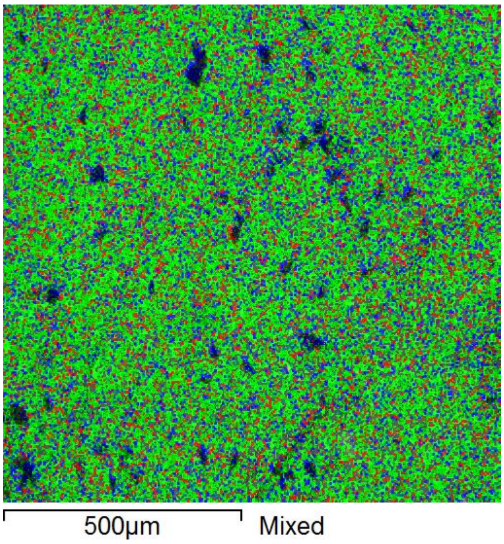
Sample S1v Sample S1ad



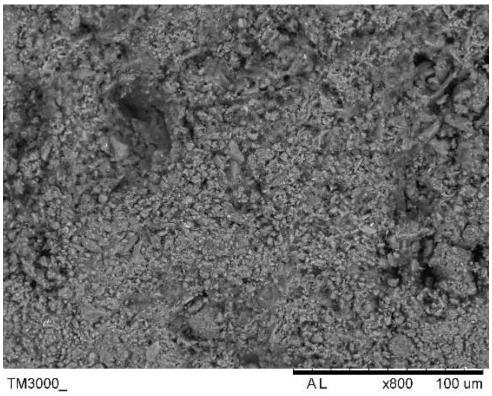


Sample S1ad Mixed map: Calcium Ka1(red), Silicon Ka1(green), Iron Ka1_2(blue)

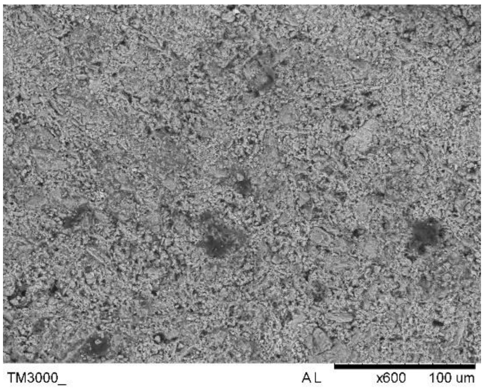




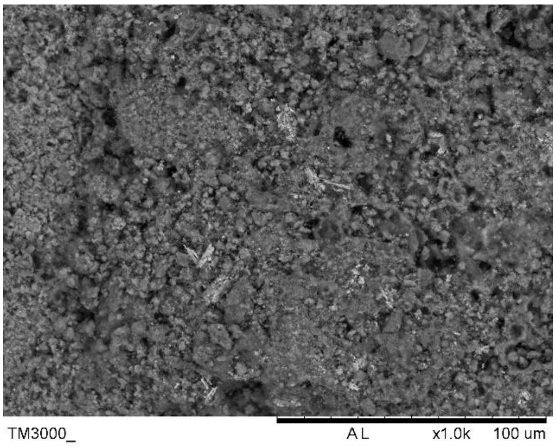
Sample S1g Mixed map: Calcium Ka1(red), Silicon Ka1(green), Carbon Ka1_2(blue)



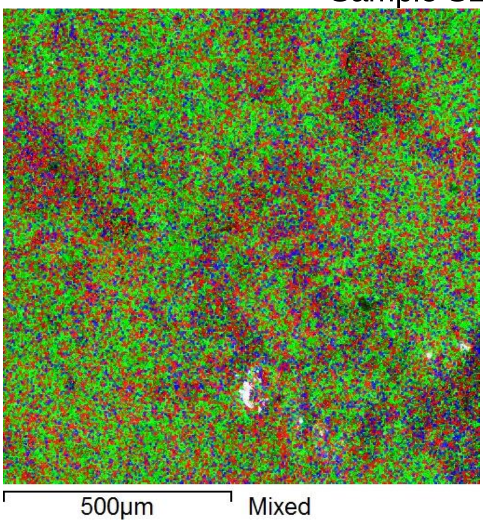
Sample S1z



Sample S1h



Sample S1q

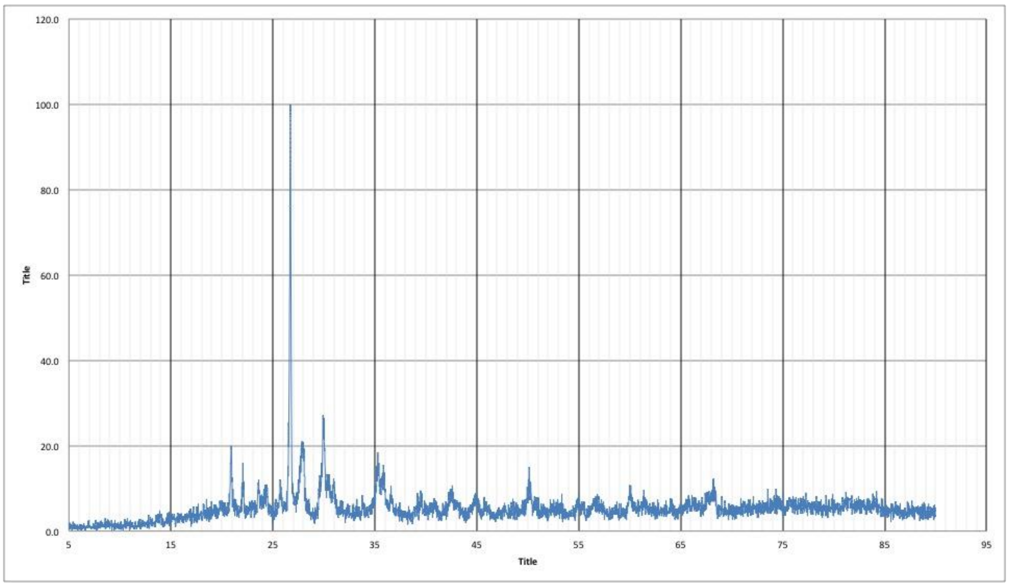


Sample S1r Mixed map: Calcium Ka1(red), Silicon Ka1(green), Phosphorus Ka1(blue)

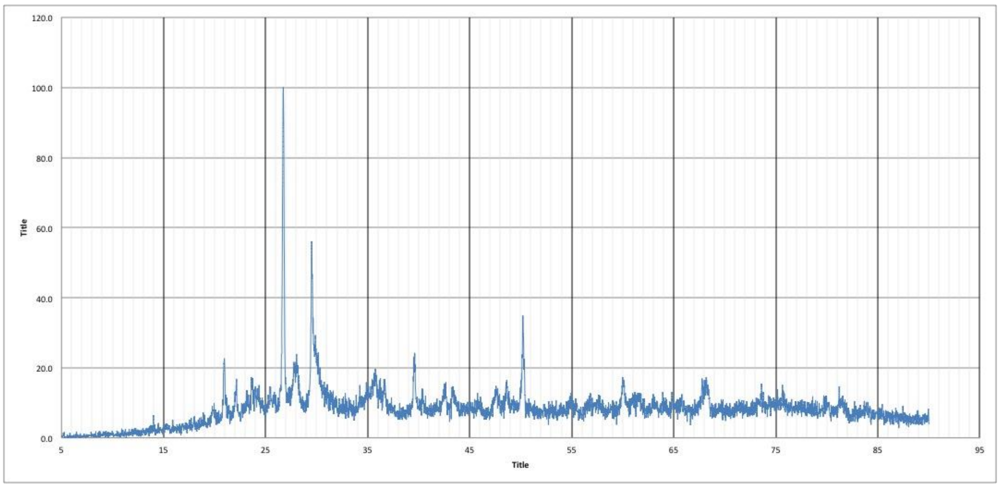
Appendix D

XRD traces of the pottery speciments

Sialk



S1g



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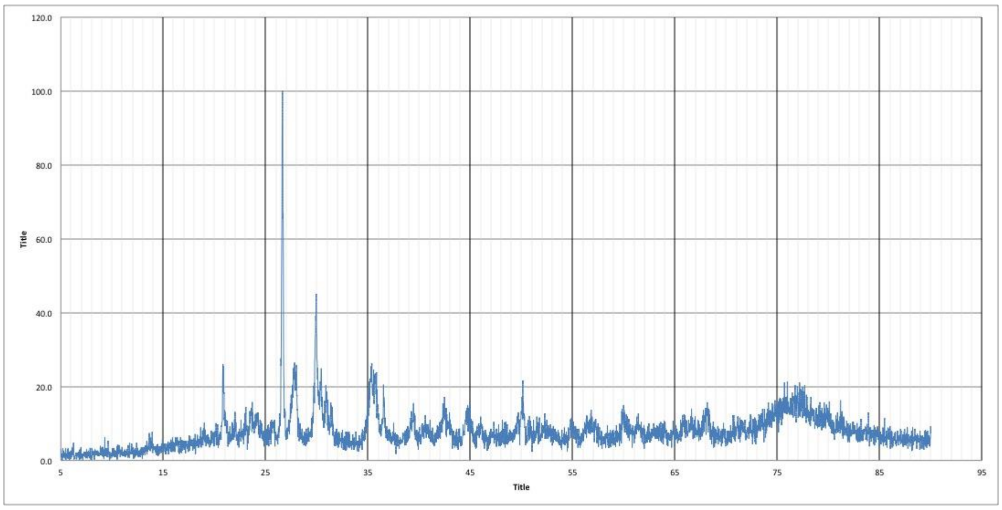
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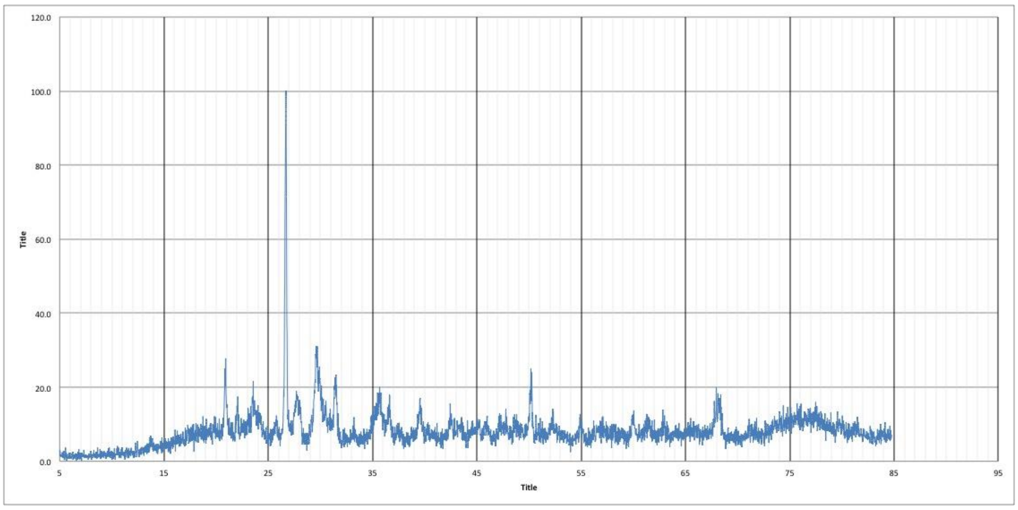
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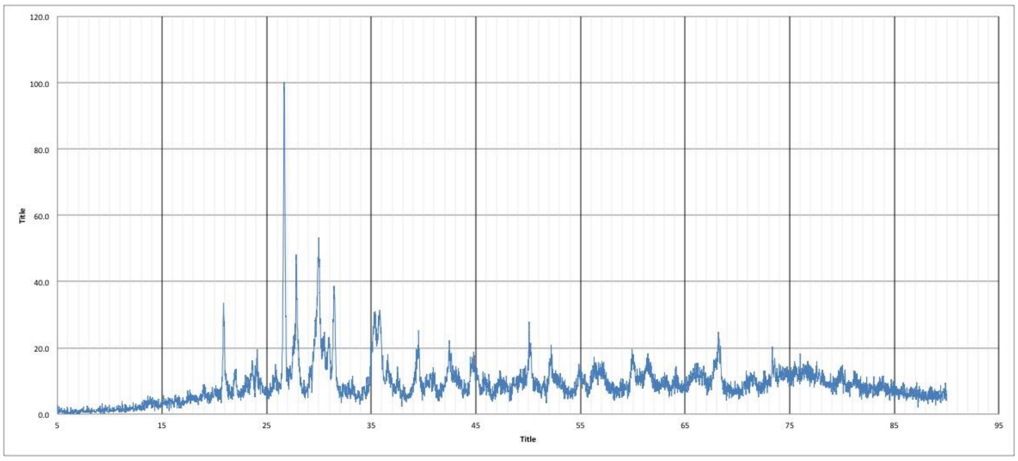
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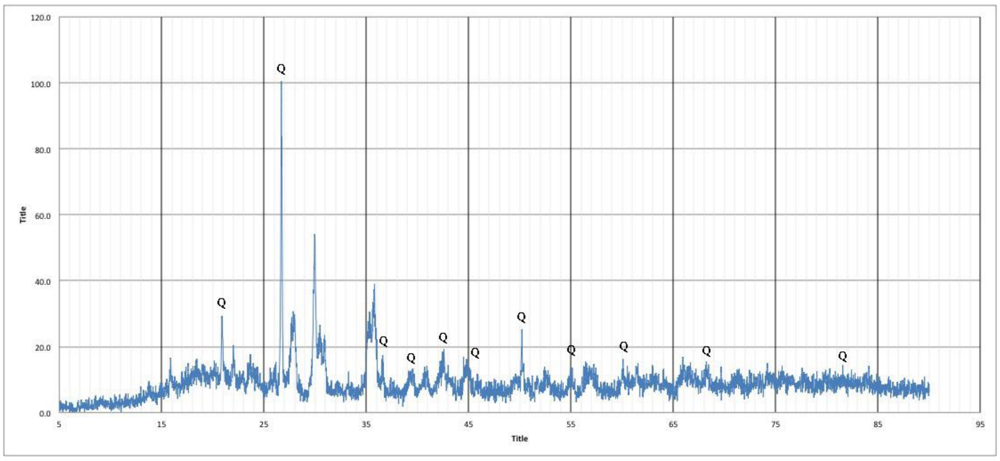
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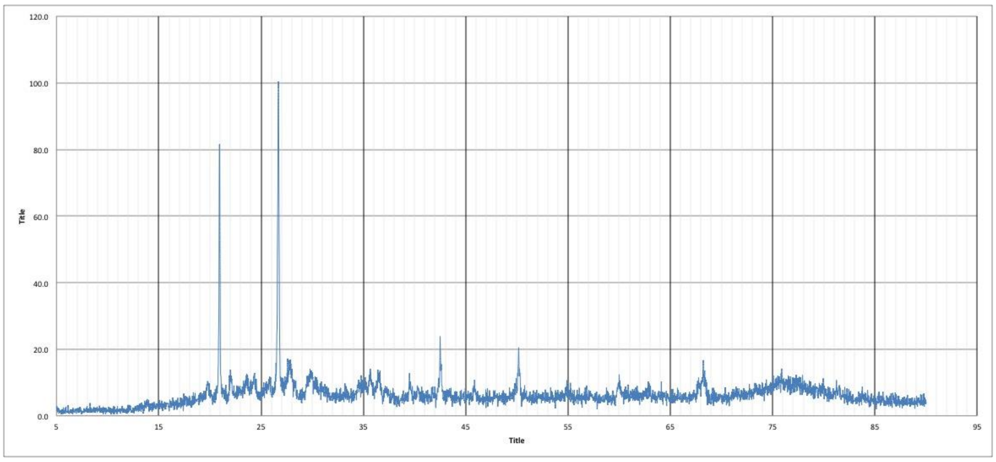
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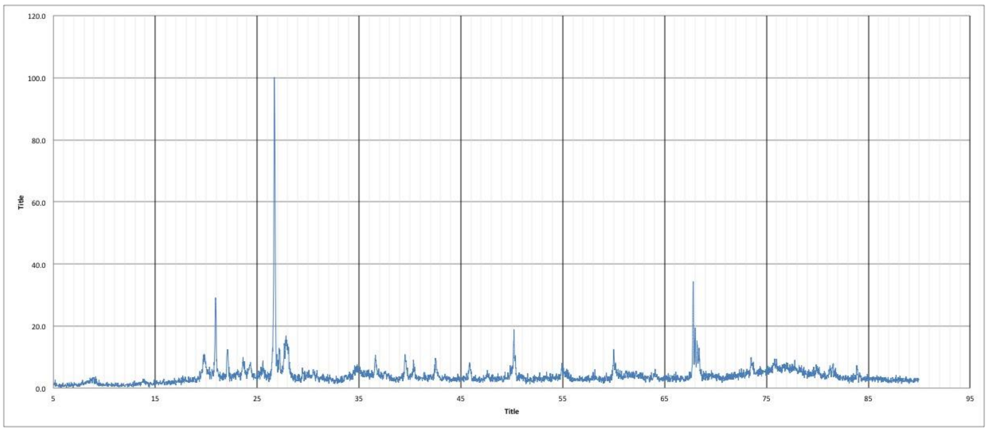
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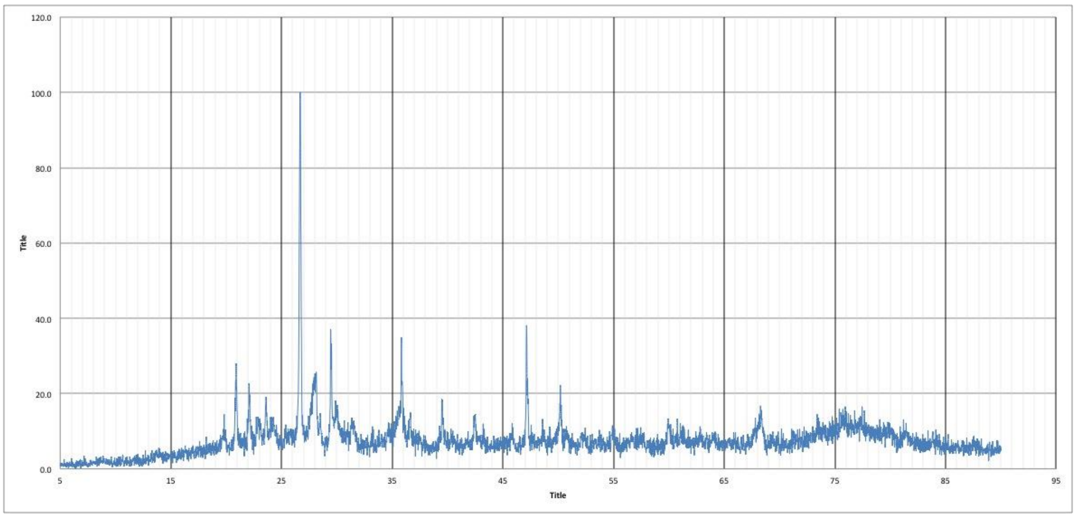
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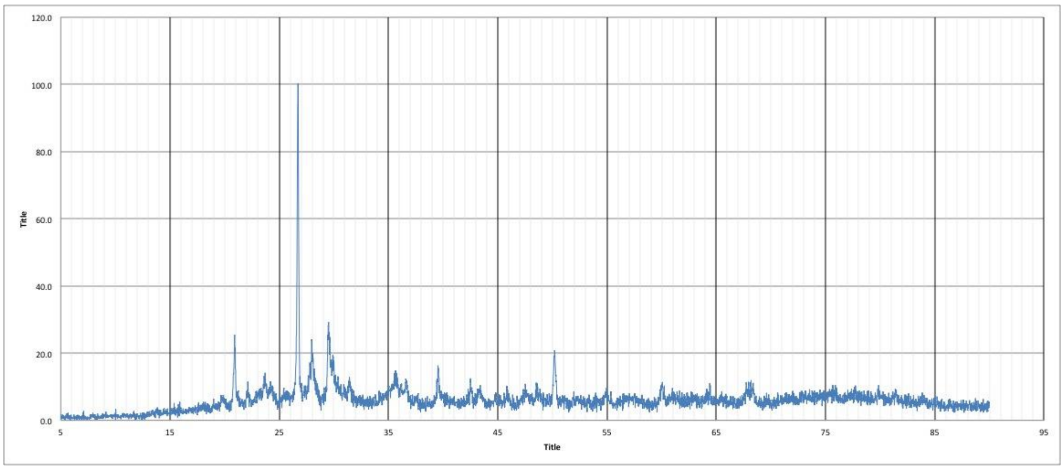
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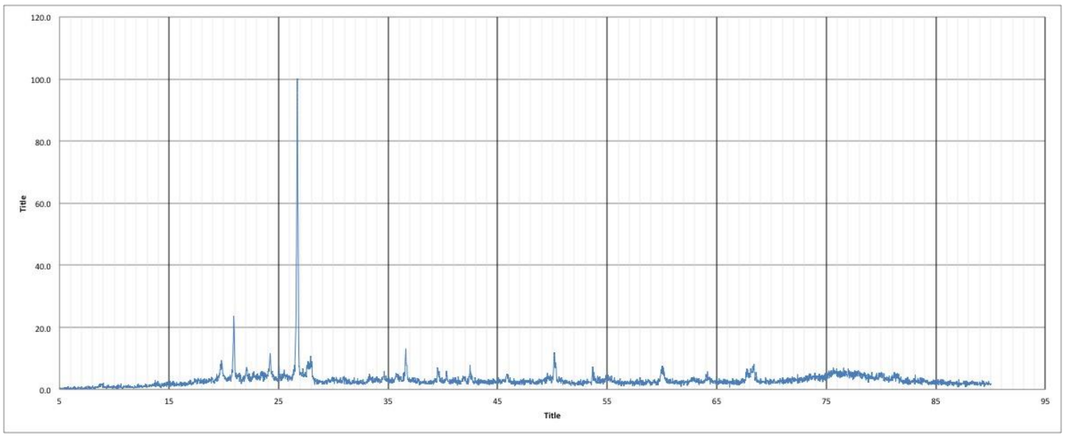
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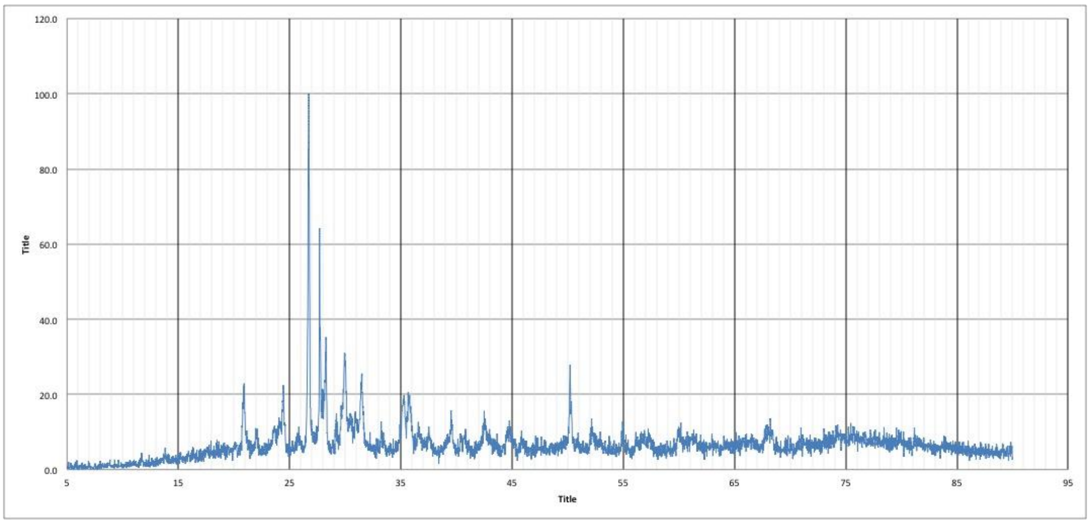
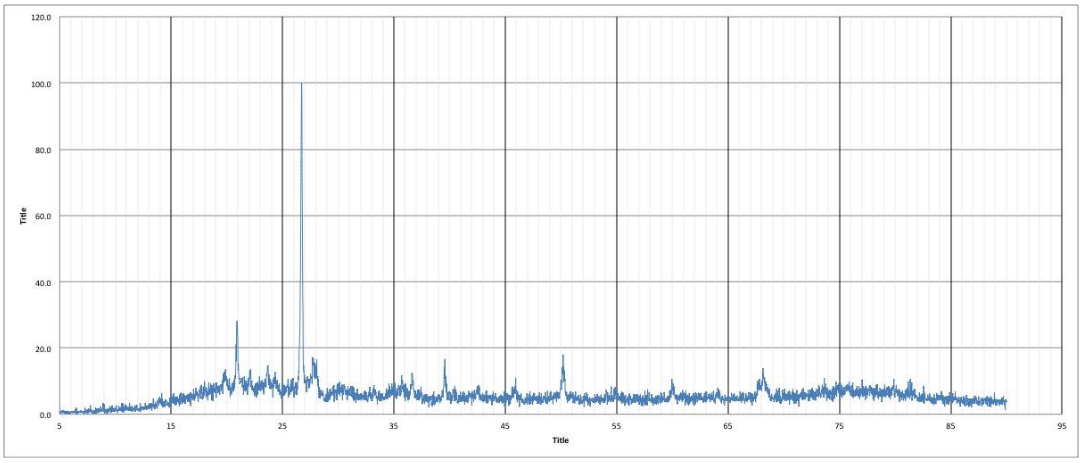


S2n



S2p

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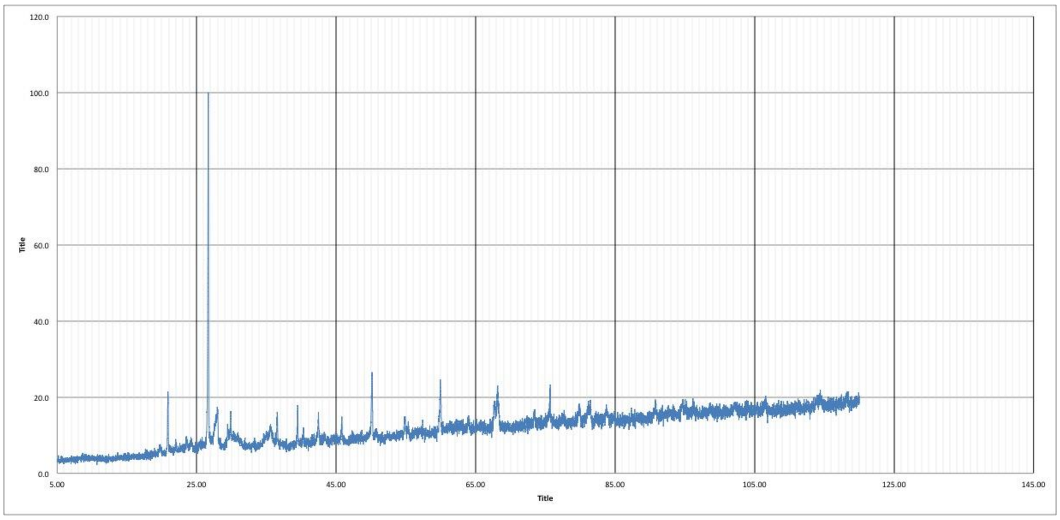

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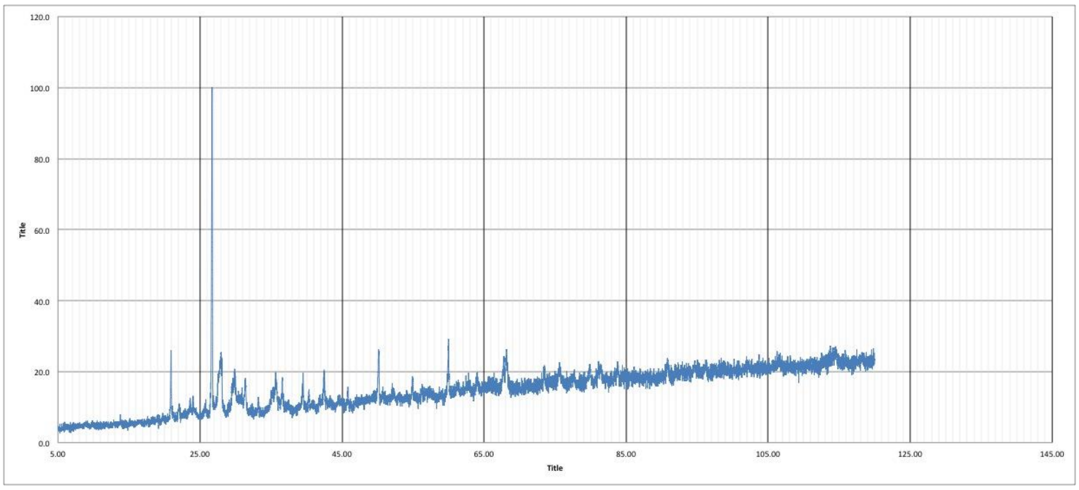
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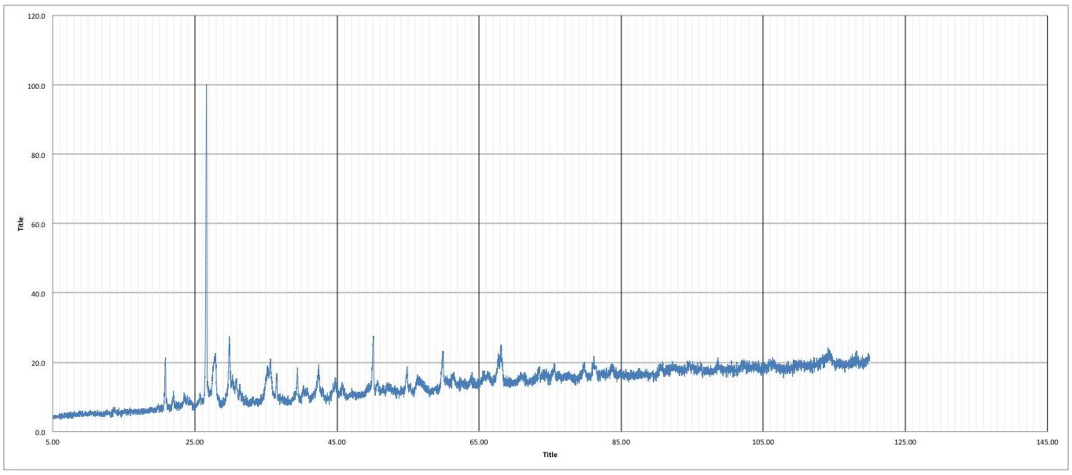
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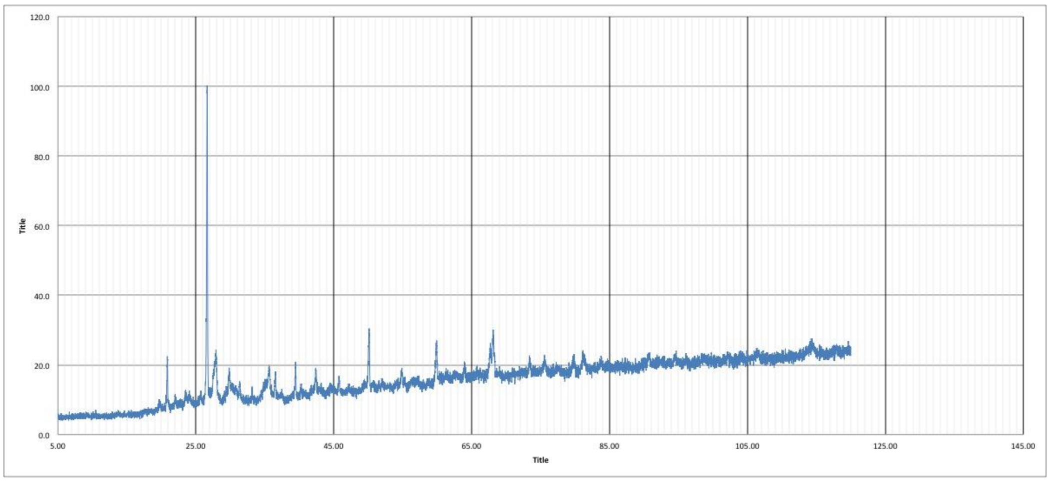
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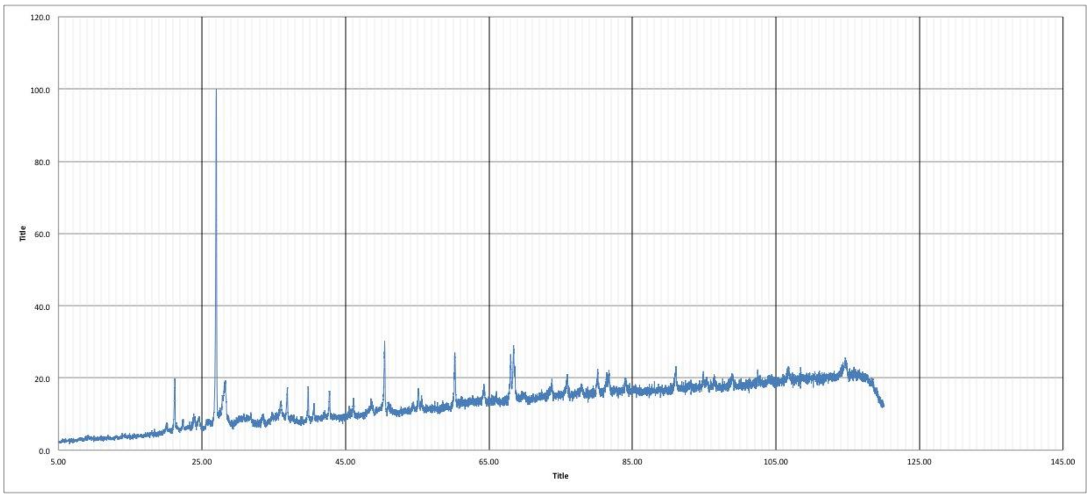
P1g



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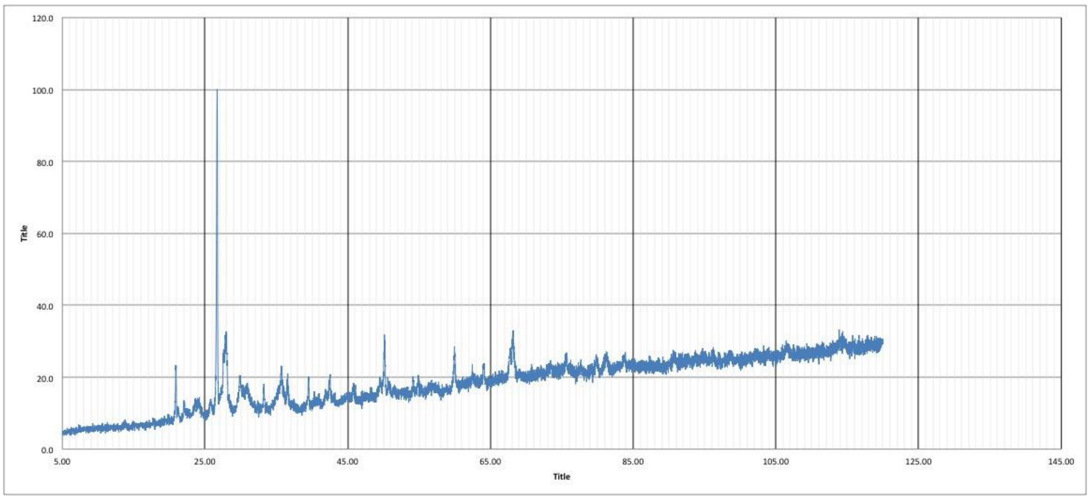
P2a



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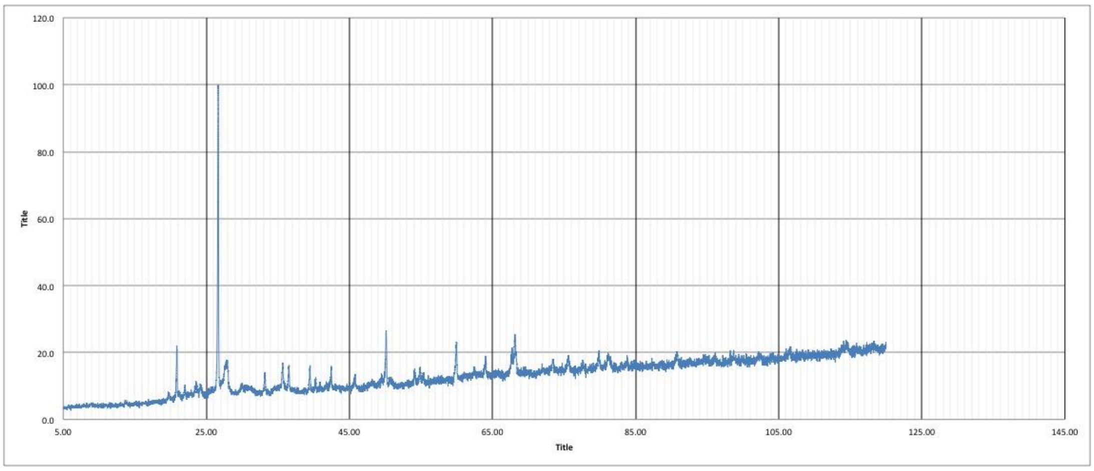
P2c



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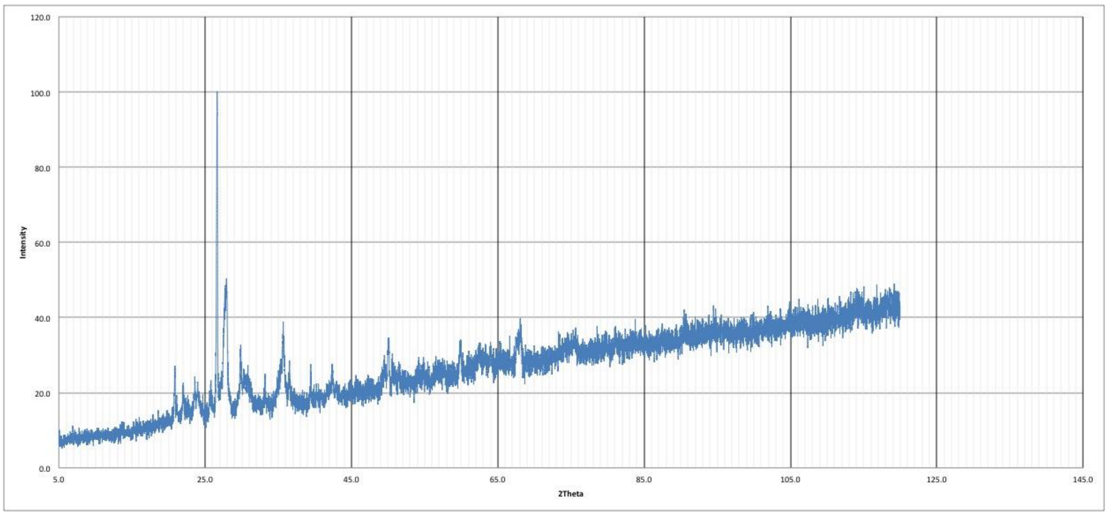

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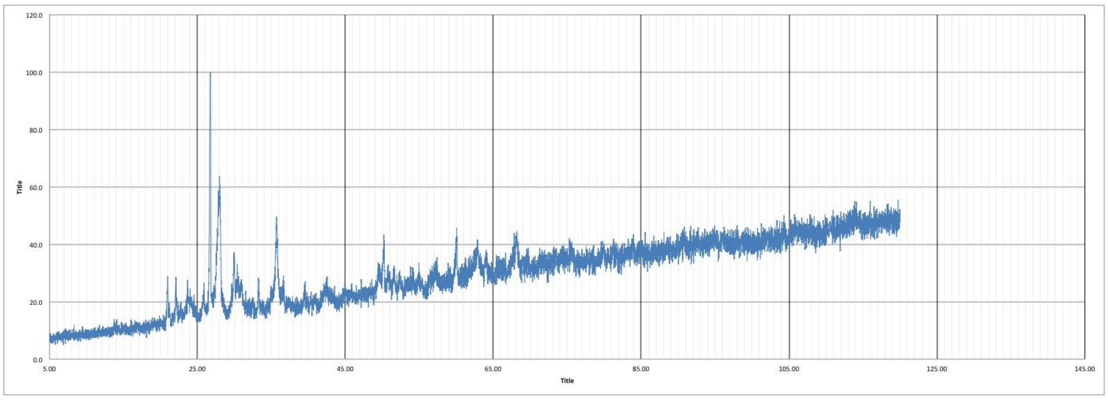

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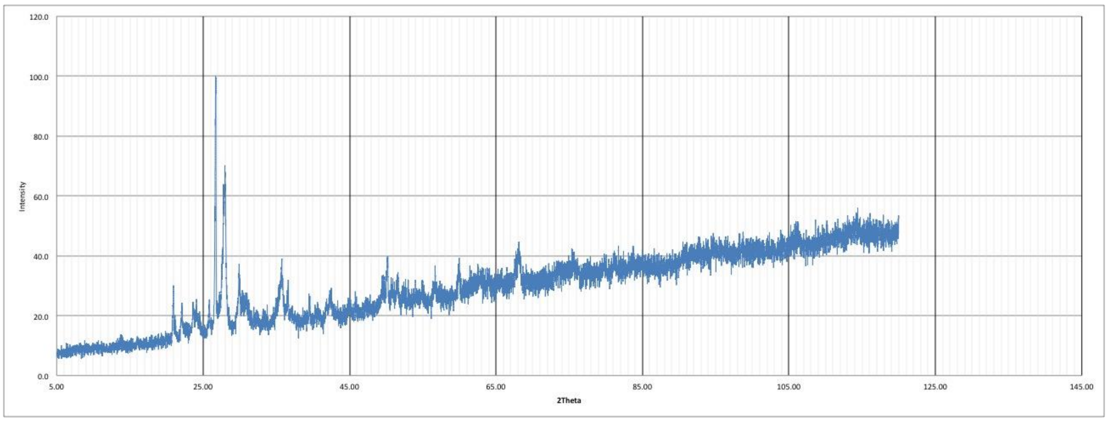

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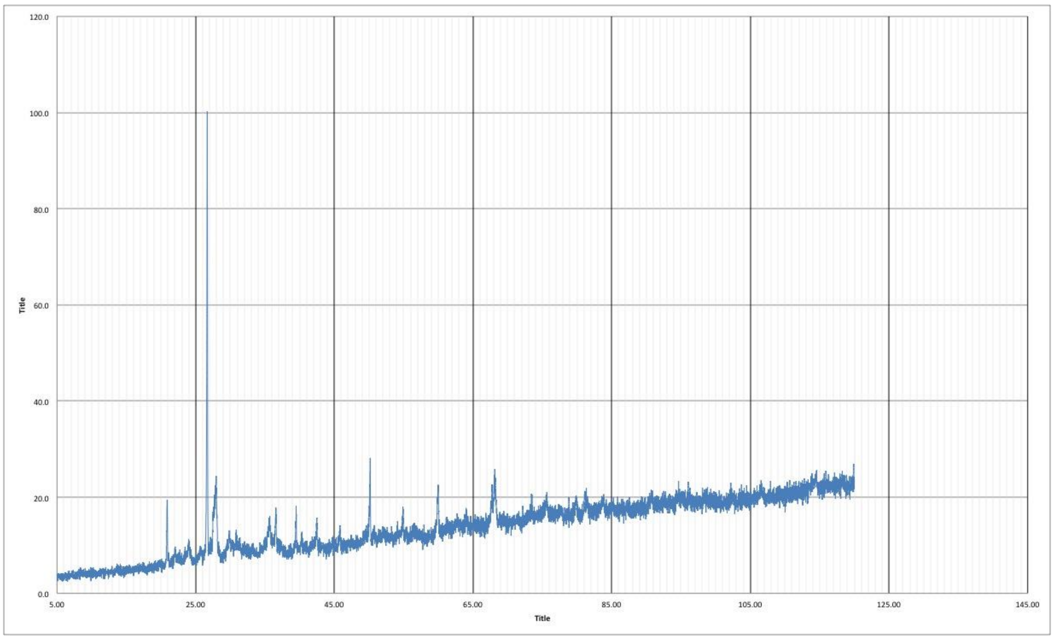
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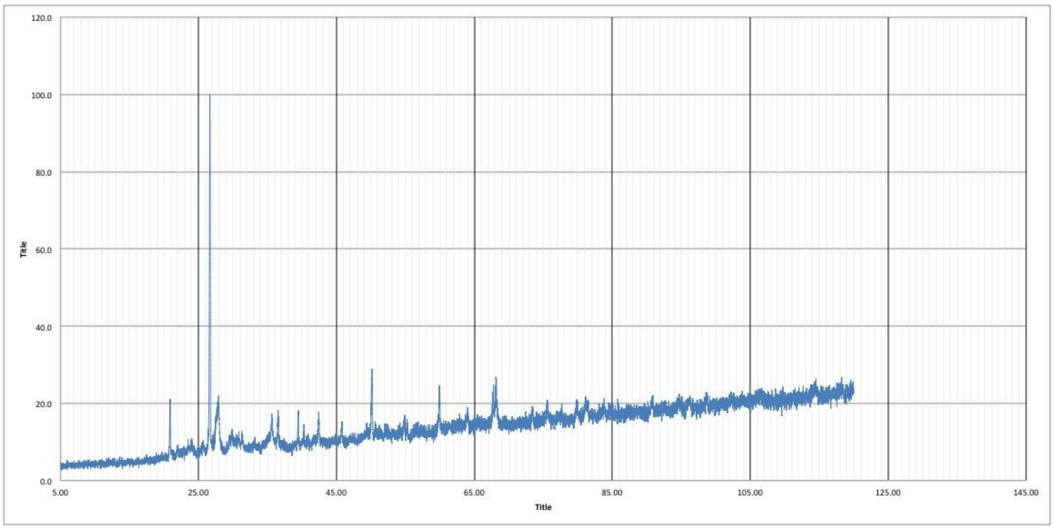
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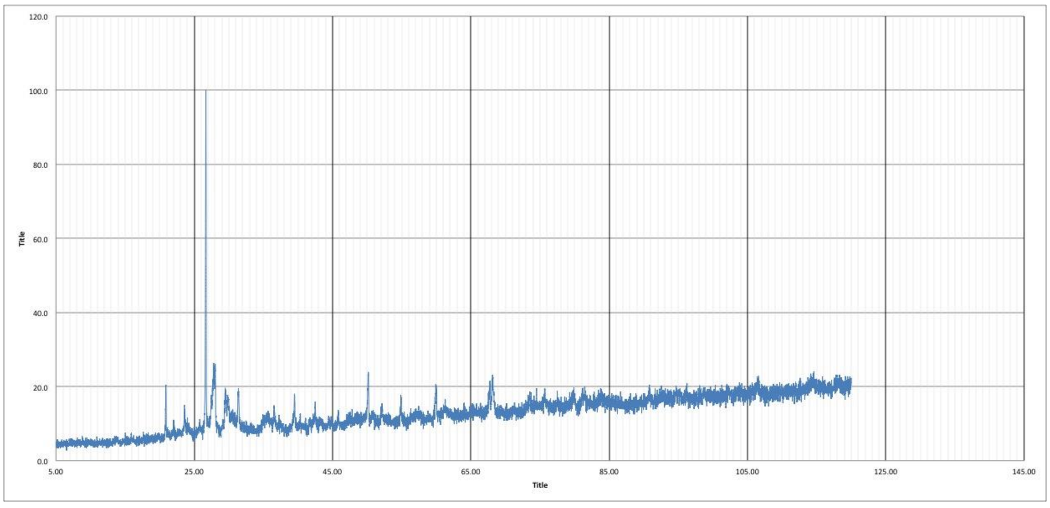
E2e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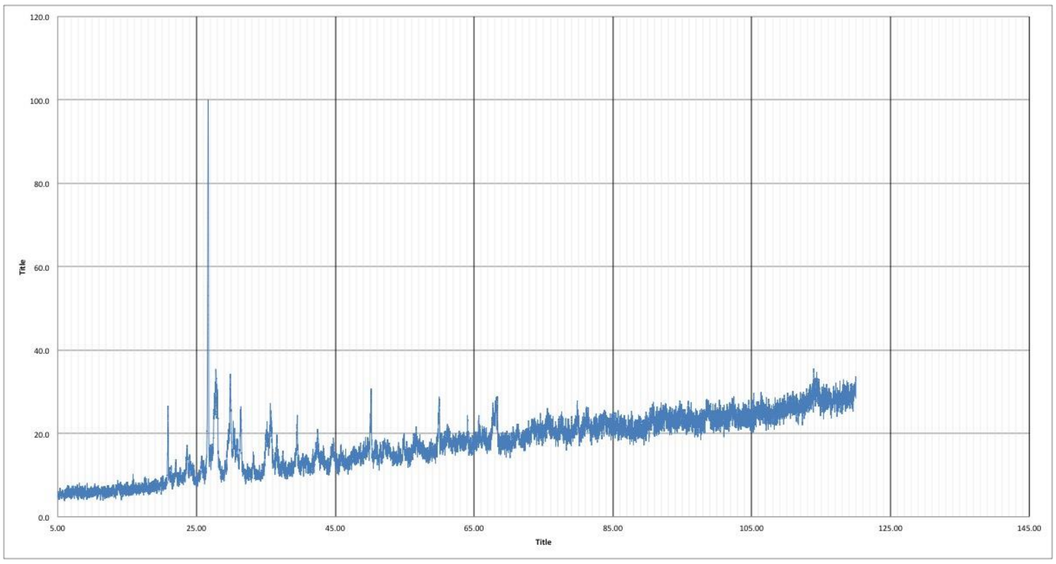
E2g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